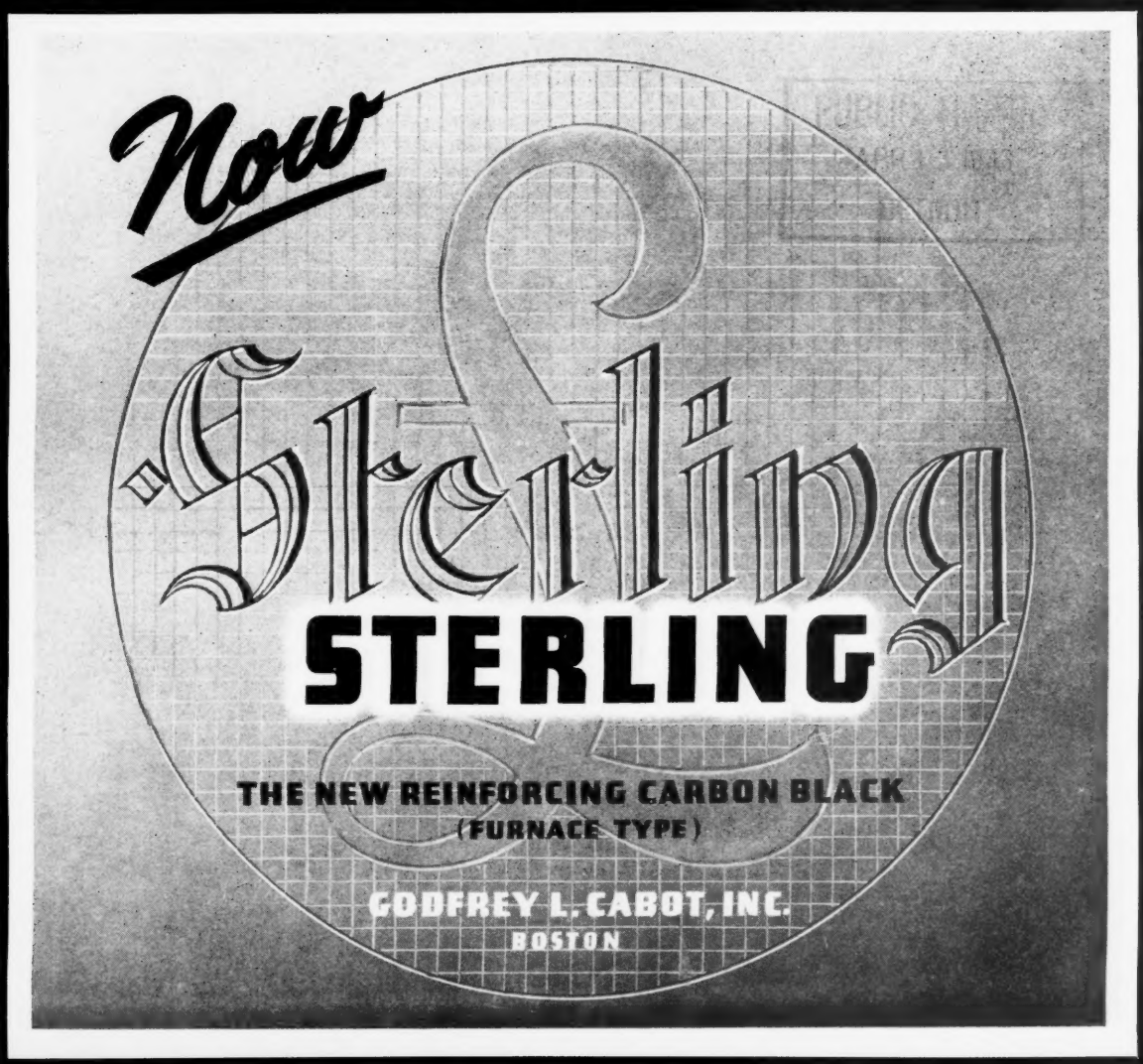
APRIL, 1943


Now
Sterling
STERLING
THE NEW REINFORCING CARBON BLACK
(FURNACE TYPE)
GODFREY L. CABOT, INC.
BOSTON

R v.108 April-Sept 1943

Newsletter No. 4
APRIL, 1943

Published by Rubber Chemicals Division of DU PONT

RPA No. 3 AND RPA No. 4 AID PROCESSING OF CRUDE AND RECLAIMED RUBBERS

THE RPA'S have been widely used for many years by the most progressive rubber manufacturers to peptize crude rubber and improve the processing qualities of rubber stocks. Their use has materially decreased breakdown time and given manufacturers additional mill capacity without requiring the installation of additional equipment. This is of major importance at the present time when it is necessary to make the best possible use of all existing facilities and manufacturing equipment. Also, the increased use of synthetics requiring relatively long breakdown cycles has had the effect of reducing the capacity of available equipment.

RPA NO. 4, a relatively new member of the group of RPA's, is the preferred peptizer for crude and reclaimed rubber. Although its cost per pound is somewhat higher than that of the other RPA's, its use cost is the lowest. RPA No. 4 is approximately 2.6 times as active as RPA No. 3 for softening and peptizing crude rubber. When substituted in this ratio, it is much more economical to use as is shown in the accompanying table based on current prices.

TABLE 1—Relative Value of RPA No. 3 and RPA No. 4 for Peptizing Crude Rubber

Material	Cost per lb.	Use Cost
RPA No. 3	$0.46	$0.46
RPA No. 4	0.80	0.31

Wide use of RPA on a factory scale has conclusively proved its economic advantage over straight mechanical mastication as a means of softening crude rubber. A comparison based on the relative strength of RPA No. 3 and RPA No. 4 shows considerable advantage for No. 4. For example, if .3 lb. RPA No. 3 per 100 lbs. of rubber were used at a given temperature and time of mastication, the substitution of .116 lb. RPA No. 4 under the same conditions would represent a saving of $0.045 per 100 lbs. for *breakdown alone*. Further, economies in power would result from the fact that RPA No. 4 is effective at masticating temperatures lower than those required with RPA No. 3.

RECLAIMED RUBBER may also be broken down and effectively softened by the use of the RPA's. Reclaimed rubber plasticized with the aid of RPA No. 3 or RPA No. 4 exhibits the following advantages over that broken down without RPA:

1. Softer and more homogeneous material with shorter time of mastication.
2. Gives smoother extruding and calendering stock.
3. Smaller quantities of physical softeners required as processing aids. This improves quality of vulcanizate.

RPA No. 4 does not exhibit the same economic advantage over RPA No. 3 in reclaimed rubber as it does in crude. However, it has been determined that when used on an equal cost basis, RPA No. 4 is at least as effective as RPA No. 3. The exact substitution ratio is difficult to determine because of variations in composition of the reclaim. We therefore suggest that initial plant runs be conducted using RPA No. 4 in quantities approximating 57% of the amount of RPA previously employed. For most purposes 1% of RPA No. 3 on the rubber hydrocarbon present is sufficient and correspondingly, .57% RPA No. 4 should provide suitable plasticizing.

The results of one series of tests comparing RPA Nos. 3 and 4 for peptizing reclaimed rubber are shown in Table II below. Plasticity-recovery* were measured after milling 500 grams of stock on a 12-inch laboratory mill.

TABLE 2—The Comparison of RPA No. 3 and RPA No. 4 for Plasticizing Whole-Tire Reclaim Rubber

Material	Milling Time at 100°C.—Min	% Used on Rubber Hydrocarbon	Plasticity-Recovery*
RPA No. 3	15	1%	139-78
RPA No. 4	15	0.57%	131-66
Control: No RPA	15	None	154-102

*Williams Parallel Plate Plastometer. The lower numbers indicate the greatest plasticity or softest stock.

Through the mill

BUNA S—Acceleration with 2-MT alone, or in combination with Accelerator 808 results in stocks having exceedingly high resilience. Use 2-MT-808 Buna S (GR-S) carcass and tread stocks to obtain vulcanizates having higher tensile strength and elongation at break and low hysteresis loss.

Thionex acceleration in Buna S (GR-S) provides a fast rate of cure and a long, flat curing plateau. The vulcanizates have excellent stress-strain properties. The long curing range of GR-S stocks accelerated with Thionex suggests their use for a variety of products.

ALLOCATIONS for NEOPRENE from Du Pont are now made as Neoprene GN and Neoprene—Other. When applying for allocation on Form PD-36-A, be sure to consider requirements for Neoprene Types FR, ILS, G, KNR, CG, E, M and Neoprene Latex Types 571 and 60 and group them separately from those for Neoprene Type GN—under Neoprene—Other.

CONSERVATION ORDER M-103 was amended by the War Production Board on January 21, 1943. The original order and previous amendments restricted the sale, use and purchase of all dyestuffs (including rubber colors) derived from anthraquinone. In addition to those restrictions, this new amendment restricts the sale and purchase, with certain specific exemptions, of all other dyestuffs (including rubber colors) and organic pigments. A copy of the Order, a letter explaining how orders for rubber colors are to be handled and also a list of du Pont rubber colors and their classification will be sent upon request.

DU PONT

RUBBER CHEMICALS DIVISION

BETTER THINGS FOR BETTER LIVING . . . Through Chemistry

INDIA RUBBER WORLD, April, 1943, Vol. 108, No. 1. Published monthly by BILL BROTHERS PUBLISHING CORP., Printing Office, Philadelphia, Pa. Editorial and advertising offices, 386 Fourth Avenue, New York, N. Y., U. S. A. Entered as second-class matter October 5, 1889, at the Post Office at Philadelphia, Pa., under the act of March 3, 1879. Subscription, United States and Mexico, $3.00 per year; all other countries, $4.00; single copies, 35 cents.

Tech

Write by Telegraph
Are you using Postal Telegraph's new Night Telegram? You can send 25 words for as little as 20 cents and never more than 50 cents between any Postal Telegraph points in the U. S.
Additional words at very little extra cost. Address and signature are
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WISHNICK TUMPEER INC=
295 MADISON AVENUE NEWYORK NY(1)=
SEND CARLOAD EACH MONTH. RESULTS ABOVE EXPECTATIONS=
J E HOGAN.

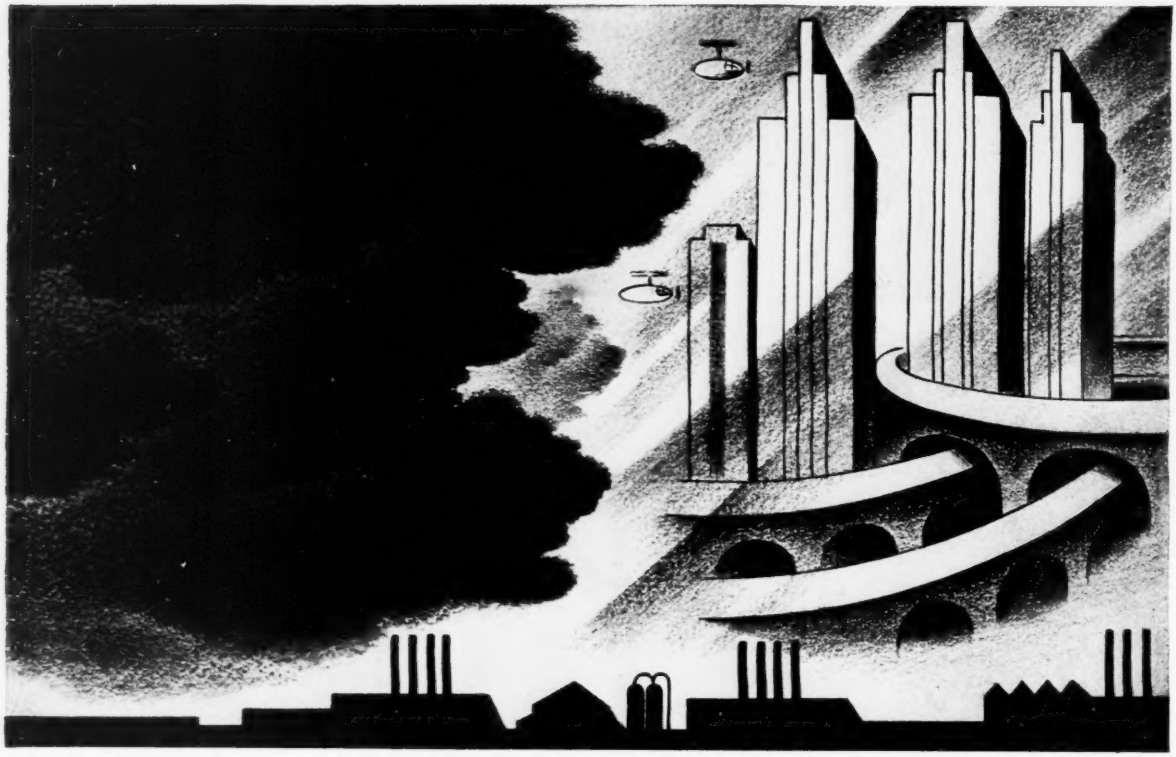
LET WITCARB HELP YOU, TOO

Do you produce rubber products in which high tensile, modulus and tear resistance must be accurately controlled? WITCARB, a special white reinforcing filler can help you get consistently effective and economical results in formulas where these properties are important. One of WITCARB'S advantages is its small, uniform particle size. Another is that it helps to conserve rubber, since in moderate loadings it does not deteriorate the physical properties of high rubber compounds. Still another is its low price. A letter will bring you a sample of WITCARB.

WISHNICK-TUMPEER, INC.

MANUFACTURERS AND EXPORTERS

New York, 295 Madison Avenue • Boston, 141 Milk Street • Chicago, Tribune Tower • Cleveland, 616 St. Clair Avenue, N. E. • Witco Affiliates: The Pioneer Asphalt Company • Panhandle Carbon Company
Foreign Office, London, England



WHEN WAR CLOUDS ROLL BY

The post-war world will be strange and new. Materials and methods hitherto unknown will make the scientific marvels of today seem dull and commonplace. In product finishing, technological advance will be tremendous . . . new bases, new techniques, new ideas . . . many already in production on war goods, but perhaps completely unknown in their logical fields of peace-time application.

Only research . . . specialized, intensive, up-to-the-minute research . . . can prepare YOUR product for the lightning changes which will blitz present production methods the moment the war is won. Will you be ready? Insure NOW that you . . . . and your post-war product . . . will be ready. Your inquiry will incur no obligation. Address The Stanley Chemical Company, East Berlin, Connecticut.

Stanley Chemical

GUARANTEE YOUR RUBBER OR RECLAIM PRODUCTS
by using
BLE AND
BLE POWDER
Naugatuck Antioxidants
for
● RESISTANCE TO HEAT AND OXIDATION
● EASE OF DISPERSION AND PROCESSING
● RESISTANCE TO FLEX-CRACKING
● RESISTANCE TO COPPER CONTAMINATION
in
TIRES . . . HEELS AND SOLES . . . CAMELBACK
BELT COVERS . . . FOOTWEAR . . . CLOTHING
WIRE INSULATION.
PROCESS–ACCELERATE–PROTECT with Naugatuck Chemicals
Naugatuck Chemical
DIVISION OF UNITED STATES RUBBER COMPANY
ROCKEFELLER CENTER NEW YORK, N. Y.
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BARRETT CHEMICALS FOR INDUSTRY

RUBBER COMPOUNDING MATERIALS

CARBONEX*—A black coal-tar hydrocarbon, in flake form, that carries a high content (40% minimum) of free carbon in finely dispersed form.

CARBONEX S*—Carbonex modified with 5% of available stearic acid for greater ease of milling into plantation or reclaimed rubber.

CARBONEX S PLASTIC*—A plastic form of Carbonex S melting between 175 and 185° F., which may be dispersed in all reclaim rubber compounds on open mills.

PLASTENDER*—A hydrocarbon product in flake form which carries a minimum of 22% free carbon in finely dispersed form.

PLASTENDER S*—Plastender modified with 5% stearic acid for greater ease of milling in plantation or reclaim rubber.

PLASTENDER SD*—This lowest melting of the Plastenders may be dispersed in all reclaim compounds on open mills.

CUMAR*—Paracoumarone-Indene Resin available in grades varying in melting point from 10° C. to 150° C. These are dependable compounding agents for rubber compounds of almost every type.

BARDOL*—A refined coal-tar distillate whose high content of aromatic hydrocarbons makes it an exceptional softener for rubber and an agent for dispersing pigments and fillers into compounds of natural or synthetic rubber.

BARDOL B*—A pale yellow to straw-colored coal-tar oil which is especially valuable as a softener for synthetic rubbers.

DISPERSING OIL No. 10—A medium-boiling oil distilling between about 225-300° C., which has good dispersing and plasticizing properties. Lower viscosity, lighter color, lower gravity than B.R.V. or S.R.O.

B.R.H. No. 2*—A semi-liquid black asphaltic product used as a rubber tackifier.

B.R.T. No. 3*—A heavy dark viscous liquid used as a saturant for fabric or woven brake linings.

B.R.T. No. 7*—A refined tar used as a rubber softener and as a wetting and softening agent in black, synthetic compounds.

B.R.V.*—A dark coal-tar oil of high-boiling range used in rubber reclaiming operations.

S.R.O.—A high-boiling, non-saponifiable oil with high penetrating qualities desirable in reclaiming operations.

RECLAIMING OIL No. 1621—A yellow or amber oil used in rubber reclaiming in both the digester and pan methods.

B.R.C. No. 20*—A solid coal-tar hydrocarbon used in rubber compounds for mechanical rubber goods to promote good working characteristics.

RESIN-C-PITCH*—A solid coal-tar derivative of value as a reinforcing softener in hard rubber compounds.

Wire or write for complete descriptions and suggested applications.

*Trade-mark Reg. U. S. Pat. Off.

THE BARRETT DIVISION
ALLIED CHEMICAL & DYE CORPORATION
40 RECTOR STREET, NEW YORK

Barrett

One of America's Great Basic Businesses

Announcing OR-25

A NEW TYPE OF HYCAR

You are familiar with Hycar OR-15. The following data are presented for the purpose of providing a basis for comparison between these two types, OR-15 and the new OR-25.

Typical Compounds of Hycar OR-15 and OR-25

Compound	1601-HCR-5	1601-HCR-6	1601-HCR-9	1601-HCR-10	1601-HCR-11	1601-HCR-12
Hycar OR-15	100.0	.....	100.0	.....	100.0	.....
Hycar OR-25	.....	100.0	.....	100.0	.....	100.0
Zinc oxide	5.0	5.0	5.0	5.0	5.0	5.0
Stearic acid	0.5	0.5	0.5	0.5	0.5	0.5
Sulfur	1.5	1.5	0.5	0.5	.....	.....
Tetramethyl thiuram disulfide	.....	.....	.....	.....	3.0	3.0
Benzothiazyl disulfide	1.5	1.5	1.5	1.5	3.0	3.0
Tetrone A	.....	.....	0.75	0.75	.....	.....
Plasticizer SC	.....	.....	15.0	15.0	15.0	15.0
Coumarone-indene-resin	10.0	10.0	.....	.....	.....	.....
Tributoxy ethyl phosphate	.....	.....	15.0	15.0	15.0	15.0
Dibutyl phthalate	15.0	15.0	.....	.....	.....	.....
Soft black (1)	100.0	100.0	.....	.....	.....	.....
Semi-reinforcing black (2)	.....	.....	70.0	70.0	70.0	70.0
	233.5	233.5	208.25	208.25	211.5	211.5

Physical Properties of the Vulcanizate

	Original					
Min. Cure at 310°F	45	45	45	45	45	45
Modulus at 300%	875	615	1850	1500	1250	720
Ultimate Tensile	1900	1575	2810	2360	2900	2000
Ultimate Elongation	650	730	475	420	665	675
Flexible to °F Loop Method	−14	−32	−50	−68	−50	−68
Brittle at °F Loop Method	−50	−68	−94	−104	−86	−94
A.S.T.M.—SAE Parallel Plate —40°F	Broke	Broke	OK	OK	OK	OK
Bend Test —65°F	Broke	Broke	Broke	OK	Broke	OK
Sp. Gr.	1.28	1.26	1.21	1.20	1.21	1.20
Shore Hardness	60	55	55	54	52	48
% Lupke Rebound	54	71	70	75	66	74
% Comp. Set A.S.T.M. Method B	9	9	6	4	12*	10* 15†
Constant deflection 70 hrs. at 212°F	62	60	40	36	44*	40* 55†
Aged in GEER OVEN 70 hours at 212°F						
Ultimate Tensile	1350	1420	2700	2350	2600	2250
Ultimate Elongation	350	300	300	285	365	355
Shore Hardness	76	72	62	63	64	61
180° Bend	OK	OK	OK	OK	OK	OK
Immersed in ASTM-SAE Oil Aniline Pt. 159°F 70 hours at 212°F						
Ultimate Tensile	1450	1350	2475	1880	2550	1950
Ultimate Elongation	505	580	315	280	385	450
Shore Hardness	65	54	65	58	65	51
% Volume Change	−3	+3	−7	+1	−8	+1
Immersed in AN-VV-O-366 Oil Aniline Pt. 189°F 70 hours at 212°F						
Ultimate Tensile	1200	1125	3000	2200	2200	2100
Ultimate Elongation	315	340	335	305	350	410
Shore Hardness	68	59	70	60	67	60
% Volume Change	−5	−2	−11	−3	−11	−6
Immersed in 100 Octane Gas 70 hours at R.T.						
Ultimate Tensile	1800	1050	2300	1925	2150	1700
Ultimate Elongation	675	640	465	360	550	600
Shore Hardness	60	52	57	54	54	47
% Volume Change	0	+2	−1	+1	−1	+1
Immersed in 40% Aromatic Gas 70 hours at R.T.						
Ultimate Tensile	750	400	1290	950	1500	950
Ultimate Elongation	530	340	275	215	470	400
Shore Hardness	47	38	50	50	44	35
% Volume Change	+17	+26	+15	+22	+18	+24

(1) Thermax used.
(2) Gastex used.

* ASTM D-395-40T 30% Deflection.
† ASTM D-395-40T 40% Deflection.

During the past 9 months experimental quantities of this new rubber, OR-25, have been manufactured for one specific war application. This trial period permitted us to stabilize methods of manufacture and prove the product both in the laboratory and the field. Now it is being made generally available, subject of course to government regulations.

OR-25 has greater low temperature flexibility and is somewhat less oil resistant than OR-15, serving to round out the present line of Hycar synthetic rubbers. The same ease of processing and compounding, characteristic of OR-15, are retained in the new Hycar OR-25.

IMPORTANT NOTICE: Because Hycar OR-25 is a new product, you are permitted under WPB regulations to purchase up to 25 pounds for experimental purposes. Order yours now.

HYCAR CHEMICAL COMPANY

AKRON, OHIO

REACHING NEW HEIGHTS...

OPACITY • WHITENESS • BRIGHTNESS • OPACITY • WHITENESS • BRIGHTNESS •

IN VALUE

Only titanium pigments, of which TITANOX is the oldest and most widely used, give all of the benefits on which the value of opaque pigments is based. Principal among these benefits is the ability to produce desired whiteness and brightness with a minimum of pigmentation.

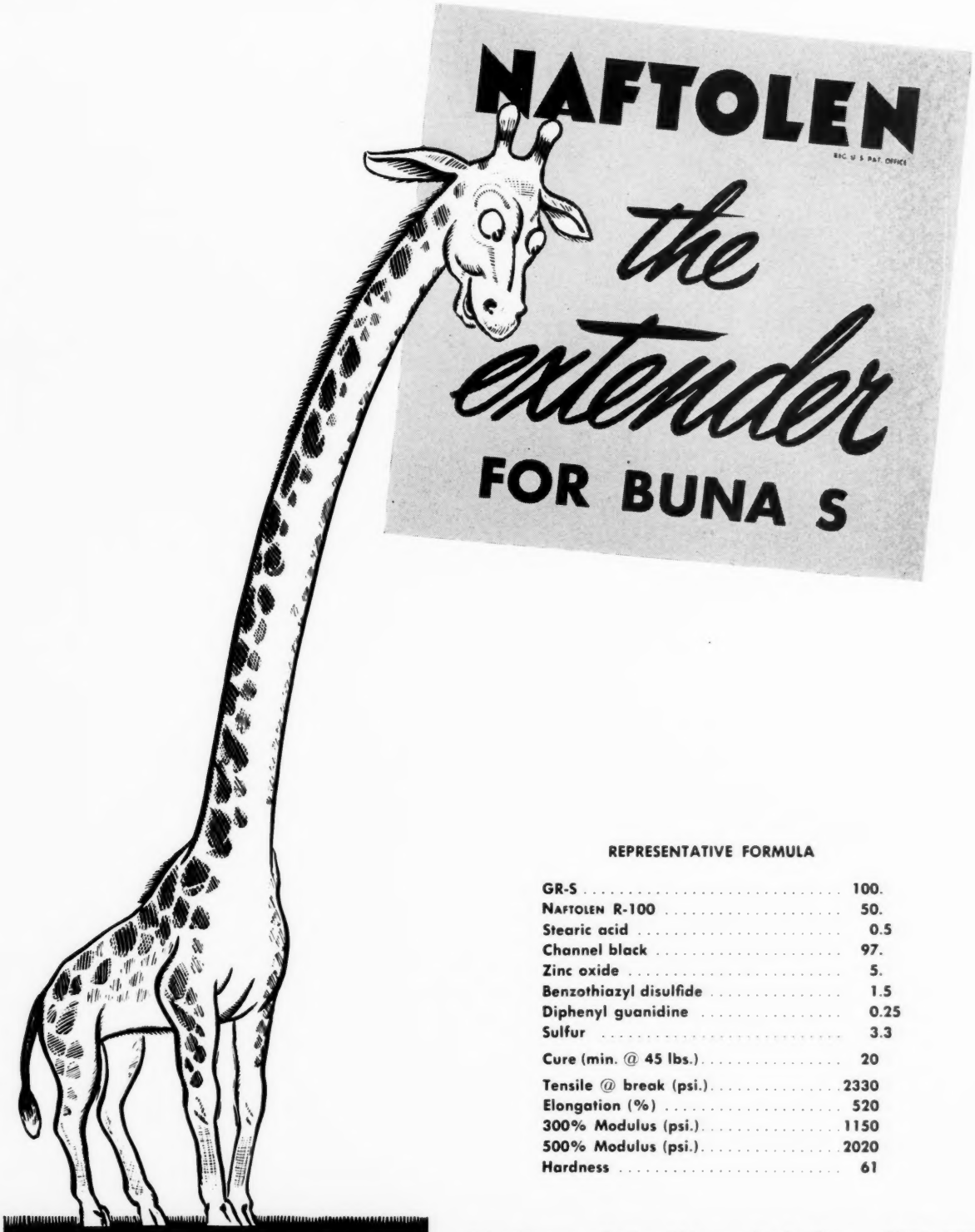
Thus in these times of rising manufacturing costs, the unsurpassed tinting strength of TITANOX contributes to desired economy wherever white pigments are used to whiten or lighten rubber products as for example, in hospital sheetings and gas masks.

This color benefit is permanent and will outlast the use-life of the product because the whiteness of TITANOX pigments is unchanging. This applies equally to synthetics, natural and reclaimed rubber.

TITANIUM PIGMENT CORPORATION, *Sole Sales Agent*
111 Broadway, New York, N. Y. • 104 South Michigan Avenue, Chicago, Illinois • 350 Townsend Street, San Francisco, Calif. • 2472 Enterprise Street, Los Angeles, Calif.

TITANOX
REG. U. S. PAT. OFF.

TITANOX
TRADE MARK



REPRESENTATIVE FORMULA

GR-S	100.
NAFTOLEN R-100	50.
Stearic acid	0.5
Channel black	97.
Zinc oxide	5.
Benzothiazyl disulfide	1.5
Diphenyl guanidine	0.25
Sulfur	3.3
Cure (min. @ 45 lbs.)	20
Tensile @ break (psi.)	2330
Elongation (%)	520
300% Modulus (psi.)	1150
500% Modulus (psi.)	2020
Hardness	61

Extend your synthetic rubber supplies by the use of 25 to 100 parts of NAFTOLEN on 100 parts of Buna S, employing 2% sulfur on the Buna S and 2 to 3% sulfur on the NAFTOLEN. For optimum properties NAFTOLEN requires 100% carbon black in addition to that normally used for the Buna S.

WILMINGTON CHEMICAL CORPORATION
10 East 40th Street · New York, N. Y.
Plant and Laboratory: *Wilmington, Delaware*

TOO little and too late can't help you in a fight against time when every ounce of energy in your organization is straining for production and more production.

In times like these, you want a source of solvents supply that you can depend on for both the quality and quantity you must have. And when you order SKELLYSOLVE—you get just that. Any quantity within reason . . . quality that's guaranteed . . . and delivery where and when you need it.

Phone, write, or wire and we'll do the rest. Special technical service, too, if you need it.

SKELLY

SKELLYSOLVE
in the
RUBBER INDUSTRY

There are six different types of Skellysolve which are especially adapted to various uses in the rubber industry, for making rubber cements, and for many different rubber fabricating operations. Skellysolve offers many advantages over benzol, rubber solvent gasoline, toluol, carbon tetrachloride, etc. It will pay you to investigate Skellysolve. Write today.

SKELLYSOLVE

SOLVENTS DIVISION, SKELLY OIL CO.
SKELLY BLDG., KANSAS CITY, MO.

KEEP EXTRUDERS *in the FIGHT!*

ROYLE
PATERSON
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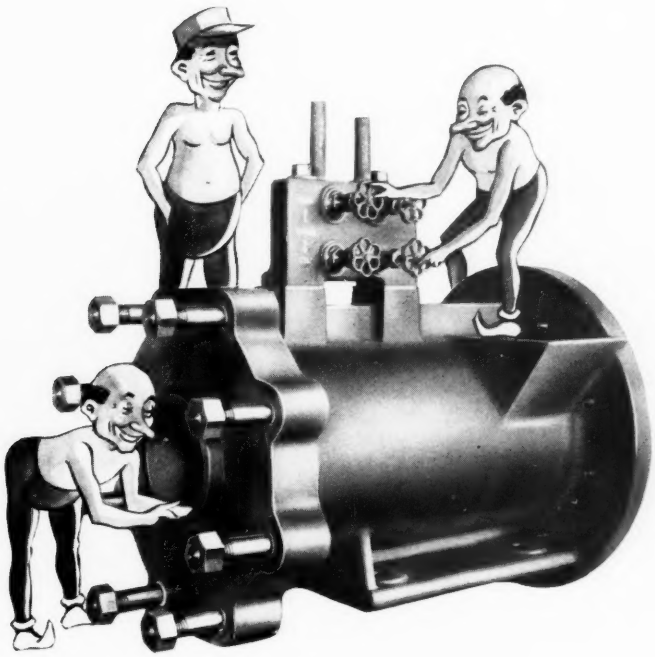


Check Cylinders for Efficiency!

Efficient production from your extruding machines, a MUST under present War requirements, depends a great deal on maintenance of proper clearance between cylinder liner and screw or worm.

Although 100% on War production of new Royle extruding machines, we have some capacity for rebuilding. Check your cylinders! Nominal diameter should be 2″, 3¼″, 4½″, 6″, 8″, 8½″ and 10″. We can rebush with cast iron liners or install latest hard, corrosion-resistant Royle liners and restore original cylinder diameter and production. Priority required.

Write, giving details. The factory and sales engineers will be happy to assist.

JOHN ROYLE & SONS

PATERSON, N. J.

AKRON: J. C. CLINEFELTER **LONDON: JAMES DAY (MACHINERY) LTD.**

NEVILLE CHEMICALS

..serving the war program

***DIBUTYL PHTHALATE**
for binding smokeless powder, for softeners for synthetic rubber, for plasticizing cellulose esters and ethers.

***RESINS FOR ADHESIVES**
to replace and extend more critical rubber, latex and vinyl resins (used in shoe adhesives, adhesives for sealing containers for vitamins, food containers, etc., for Army, Navy and overseas shipments).

***RESINS AND SOLVENTS**
for waterproof and flameproof impregnants for cotton duck, used for Jeep tops, tents, tarpaulins, etc.

***SOLVENTS (TOLLAC-NEVSOL)**
for replacing toluol, which is so essential to TNT production.

***GUANIDINE NITRATE**
an ammunition component.

***CREOSOTE OIL**
for wood-preserving . . . ties for railroads, piles for new ship bases.

***NEVILLAC RESINS**
for grease-proof and water-proof papers for packaging aircraft parts, rifles, Army rations (outside wrappers), machine parts, and other war equipment.

***WIRE ENAMEL THINNERS**
for magnetic wires—for radio transmission, etc.

***RESINS FOR ANTI-FOULING**
shipbottom paint for Navy Ships.

***RESINS AND THINNERS**
for protective coatings for all types of war goods.

***RUBBER-COMPOUNDING OILS AND RESINS**
for war-essential rubber manufacture.

***ICE PREVENTATIVE OIL**
for treatment of aeroplane rubber spinner caps to minimize ice accumulation.

THE NEVILLE COMPANY

PITTSBURGH • PA.

BENZOL • TOLUOL • XYLOL • TOLLAC • NEVSOL • CRUDE COAL-TAR SOLVENTS
HI-FLASH SOLVENTS • COUMARONE-INDENE RESINS • TERPENE RESINS • TAR PAINTS
RUBBER COMPOUNDING MATERIALS • WIRE ENAMEL THINNERS • DIBUTYL PHTHALATE
RECLAIMING, PLASTICIZING, NEUTRAL, CREOSOTE, AND SHINGLE STAIN OILS

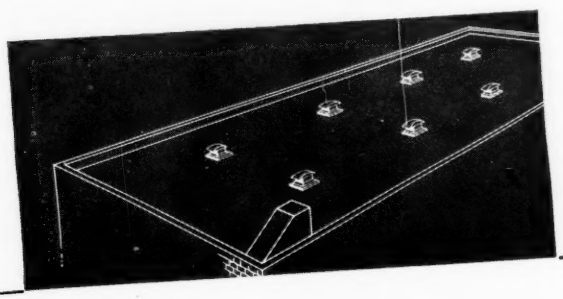
A-8

Carrier
WAR PLANT VENTILATORS

Installed in Roof . . .
No Floor Space Needed!

War plant workers need air free from excessive heat or humidity to maintain maximum production. In warm weather, extra quantities of outdoor air must be provided for ventilation to prevent indoor temperatures from soaring. In winter weather, the air for ventilation must be tempered to prevent drafts and cold areas.

Carrier War Plant Ventilators replace hot, humid air in summer—temper ventilating air in winter. They are available in 3 types to provide blackout and other factory buildings with uniformly distributed air for correct ventilation.



1. **Carrier Exhaust Ventilators** (shown above) remove hot, humid air from the plant, exhausting it at the roof.

2. **Carrier Supply Ventilators** replace the excessively hot plant air with relatively cool air from outdoors, drawing the air in at the roof and supplying it with uniform circulation to working areas.

3. **Carrier Tempering Ventilators** warm and deliver air to the plant, drawing the air in at the roof and supplying it with uniform circulation to the working areas, thereby providing the needed ventilation with tempered air to prevent drafts and cold spots in the plant during cold weather.

Features: Critical materials conserved by use of non-ferrous panels. No extra "preparedness" for blackout plants—no light transmission or reflection in blackouts. No protective housing or elaborate roof supports. Built to withstand weather. Light in weight. Designed to become a permanent part of the building. Constructed to keep out rain and snow.

Mail coupon for complete information. Learn how Carrier War Plant Ventilators can be used to advantage in your plant.

CARRIER CORPORATION, Syracuse, N. Y.

Please send literature on Carrier War Plant Ventilators. Desk 52-D

Name.....

Company.....

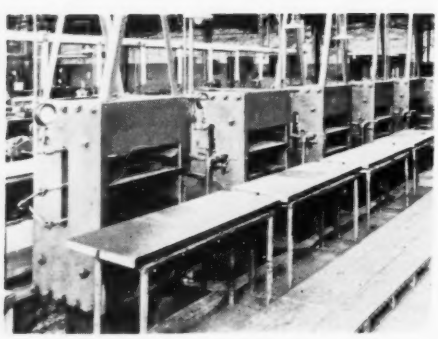
Address..... City.....

Carrier

ARMY E NAVY

AIR CONDITIONING • REFRIGERATION

Save Steam Save Maintenance.. with SOUTHWARK HYDRAULIC PRESSES



Lower maintenance, less steam and neater appearance are three important reasons why this side slab type press is preferred for hard rubber molding.

Southwark side slab presses confine heat within the molds and steam plates; assure positive guiding and greater rigidity.

This is but one of the many types of Southwark Hydraulic Steam Platen Presses engineered to meet today's requirements in rubber and plastics manufacture. When you're planning new plant equipment for the competition of tomorrow it will pay you to specify Southwark.

Baldwin Southwark Division, The Baldwin Locomotive Works, Philadelphia; Pacific Coast Representative, The Pelton Water Wheel Co., San Francisco.

BLW THE BALDWIN GROUP **BALDWIN SOUTHWARK**

Division **THE BALDWIN LOCOMOTIVE WORKS,** *Philadelphia, Pa.*

Another Good Reason For Using HYDRATED ALUMINA C-741

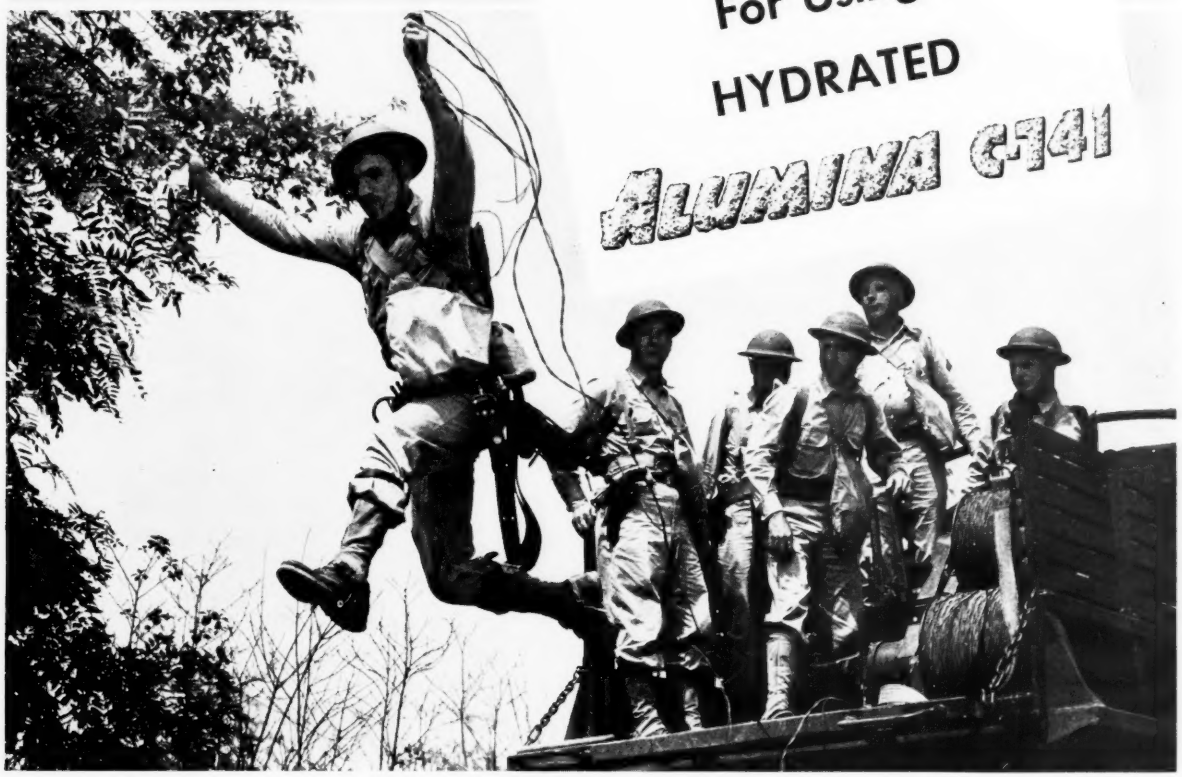


Photo by U. S. Army Signal Corps

When the Signal Corps goes into action, there's no time to be easy on materials. Rubber insulation on lines laid down in a hurry has to be able to take abuse and like it.

Hydrated Alumina C-741, used as a reinforcing pigment in rubber for wire insulation, helps produce insulation that has high physical and dielectric strength. The rubber is tough, resilient, and highly resistant to tear and aging.

Hydrated Alumina C-741 can be satisfactorily substituted for equal volumes of high-quality reinforcing pigment. Properties of the finished product are equal or better, and the weight of the rubber is as much as 12% less.

If you are making military products employing rubber, it may pay you to investigate the use of Hydrated Alumina C-741. We'll gladly send you a sample for trial. ALUMINUM COMPANY OF AMERICA (*Sales Agent for* ALUMINUM ORE COMPANY) 1909 Gulf Building, Pittsburgh, Pa.

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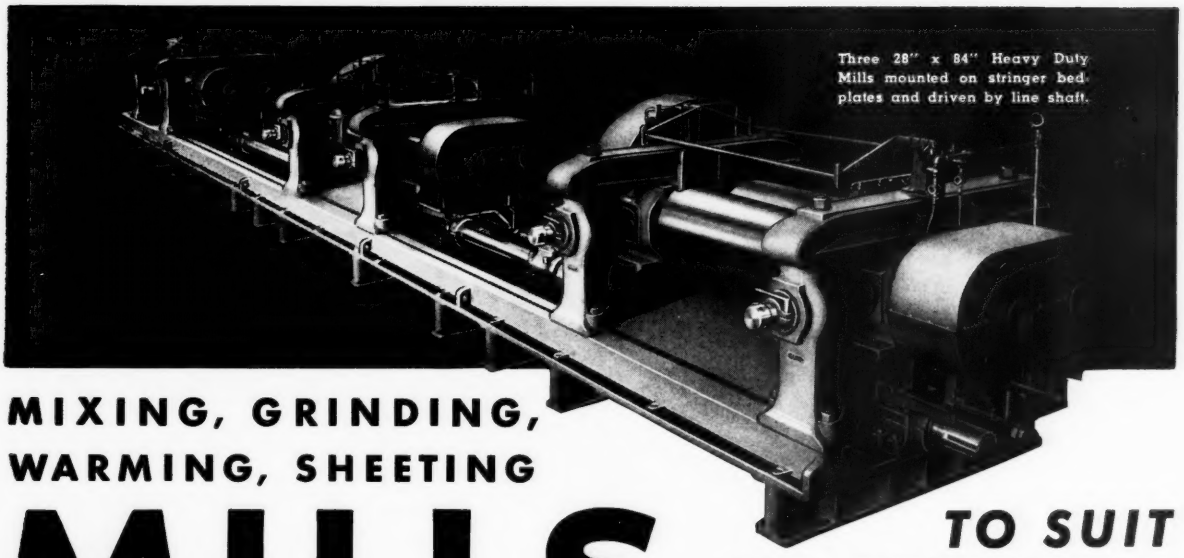

Three 28" x 84" Heavy Duty Mills mounted on stringer bed plates and driven by line shaft.

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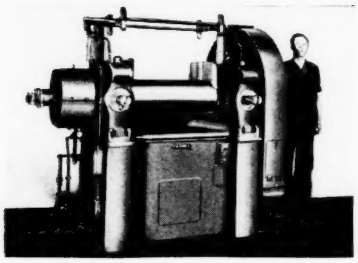
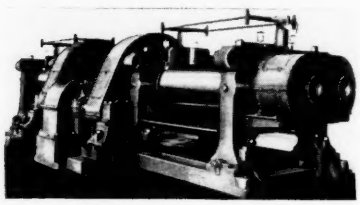
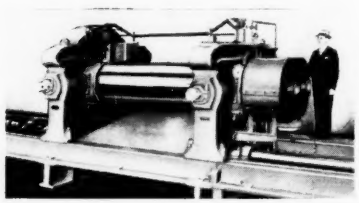


Self-contained Mill, typical of 6", 8" and 12" sizes. Motor and drive are housed inside high welded steel base to save floor space.



A unit of two 22" x 60" Mills driven by a single 250 HP motor through a right angle drive between the Mills.



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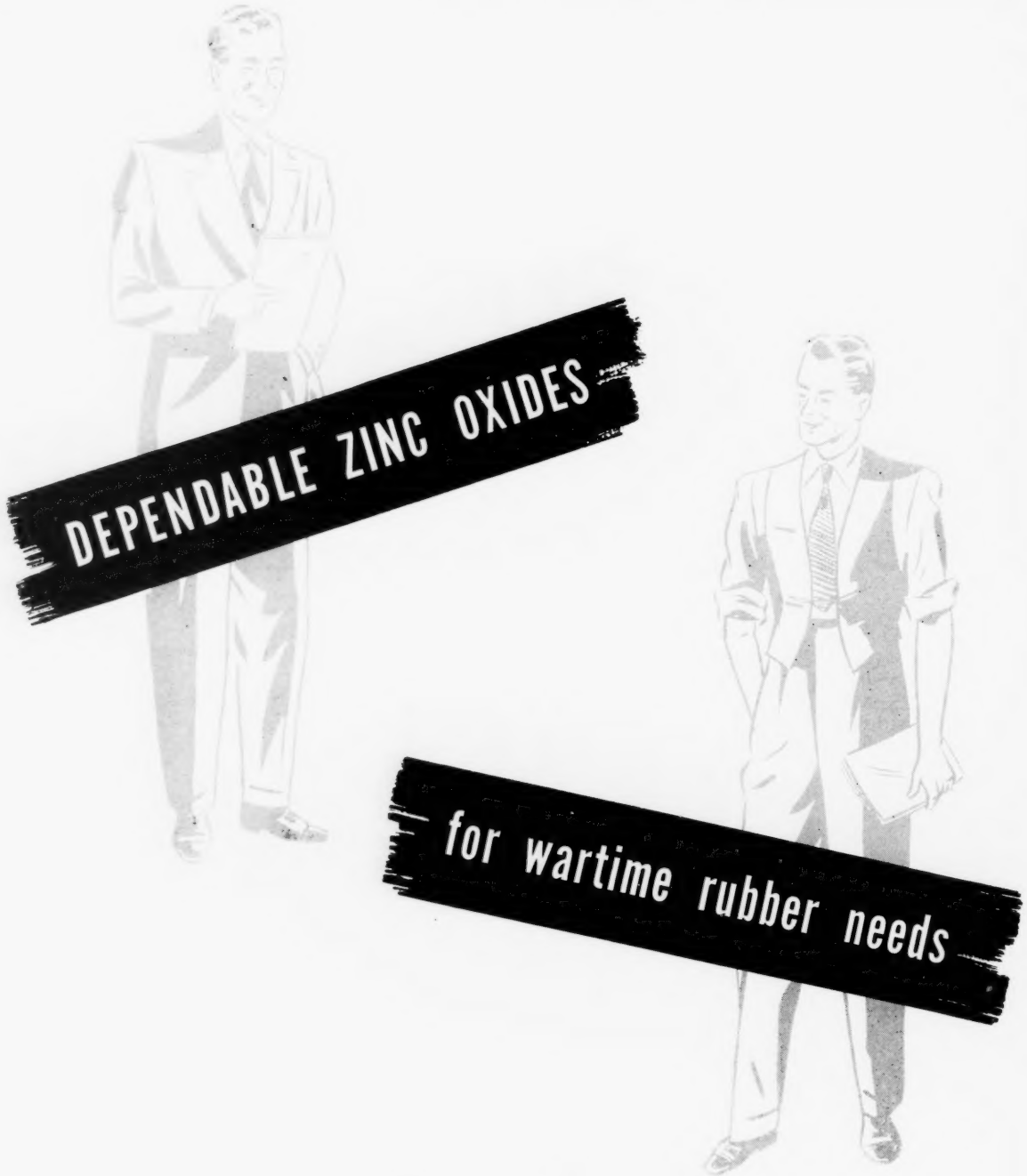
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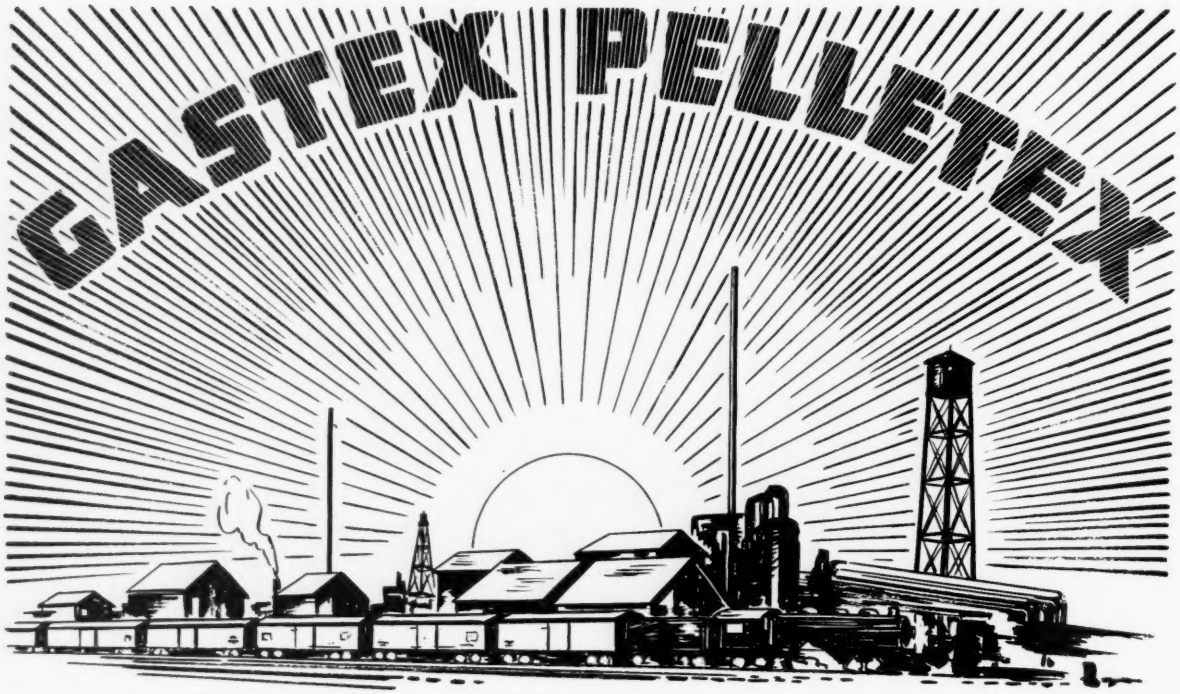

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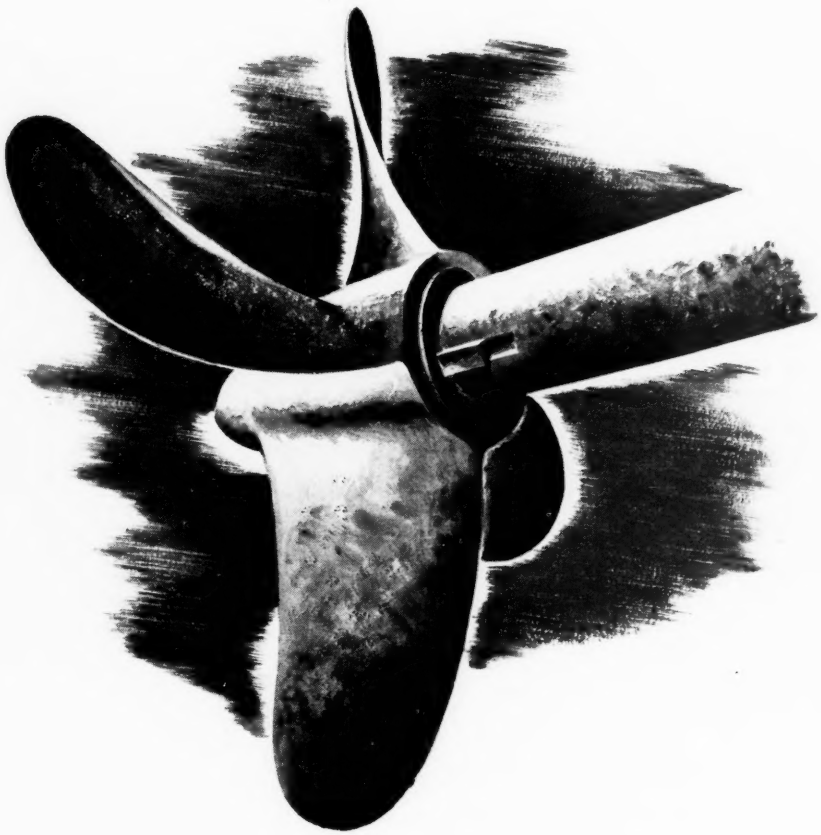

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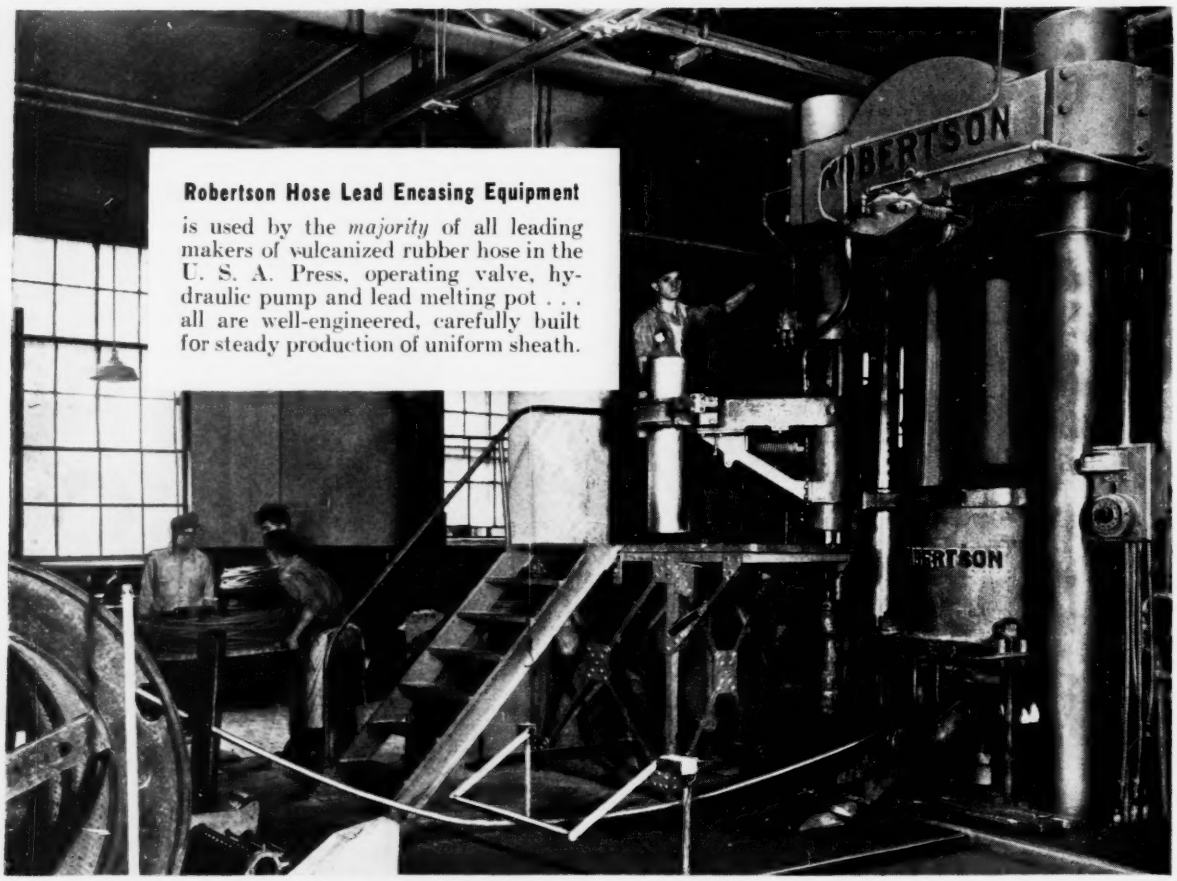

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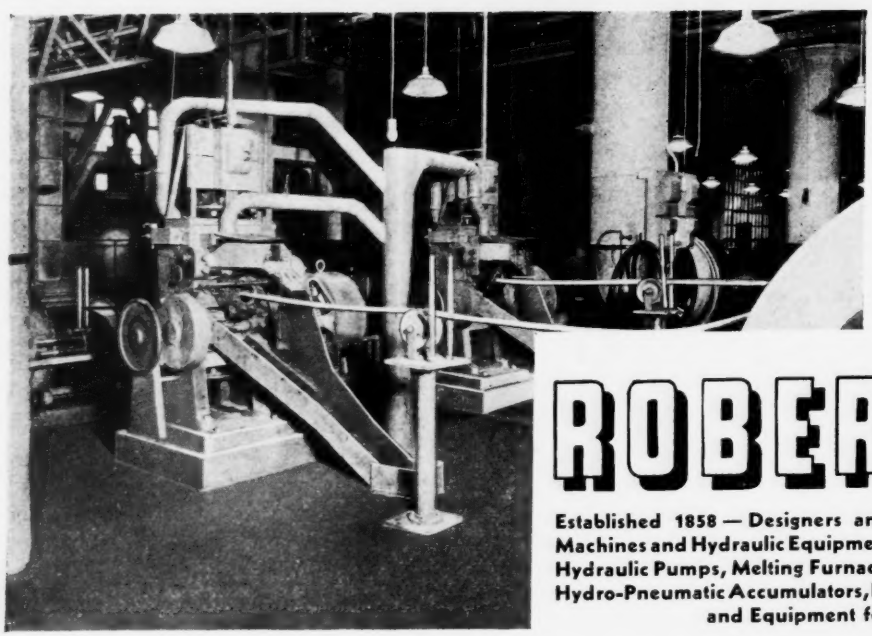

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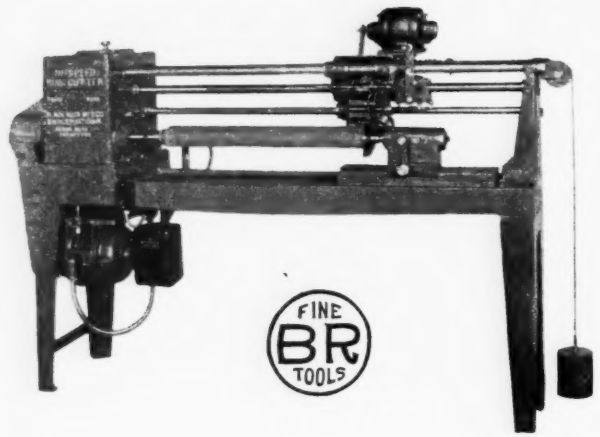

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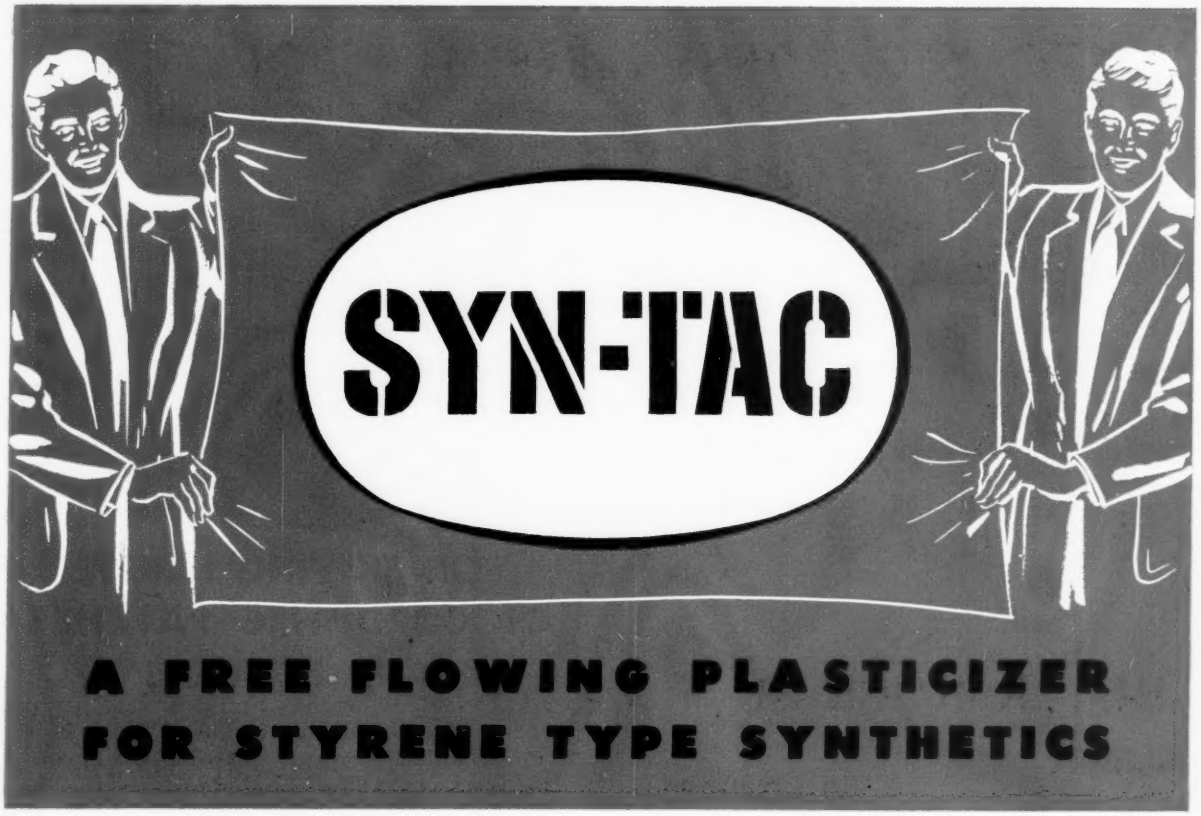

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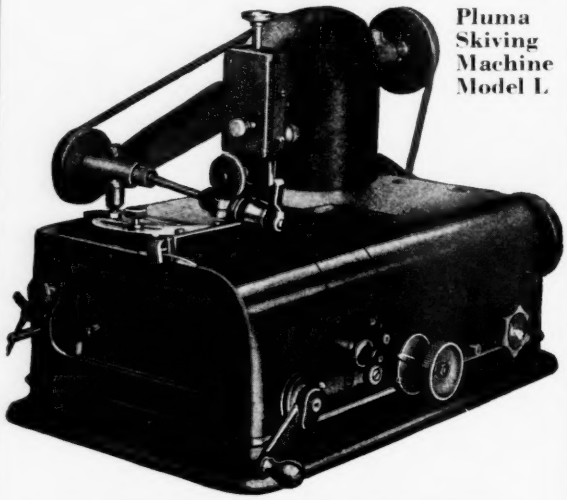

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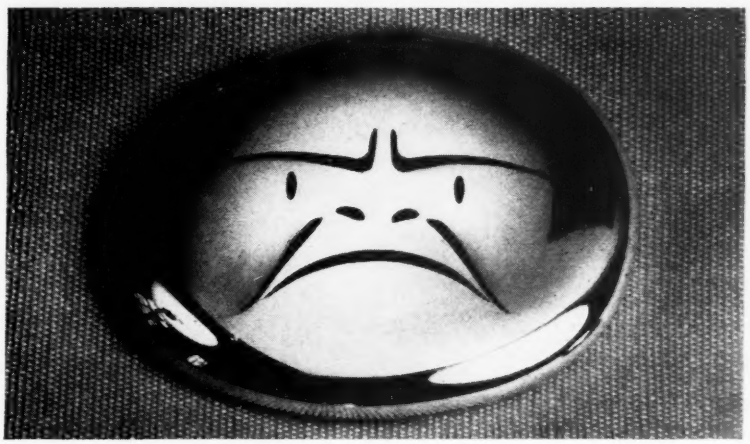

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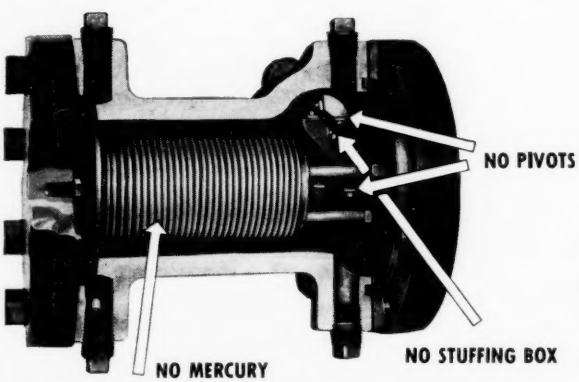

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Executive Offices:
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The Energy Rebound Test procedure is described on page 28 of the HUBER book "Evaluating Carbon Black".

April, 1943

VOLUME 108 NUMBER 1

A Bill Brothers Publication

INDIA RUBBER WORLD

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Volume 108 **New York, April, 1943** **Number 1**

The Solubility of Sulphur in Butadiene-Styrene Copolymer

Ira Williams[1]

THE solubility of sulphur in rubber has been studied sufficiently[2, 3, 4] that the various phenomena connected with solubility are well known. Among the important factors are the available concentration of sulphur at any temperature, the diffusion of sulphur in the rubber,[4] blooming of both vulcanized and unvulcanized rubber and the effect of supersaturation[3] on the formation of bloom. Similar studies have not been reported on the synthetic rubbers which are vulcanized with sulphur. The present paper deals with the solubility of sulphur in a butadiene-styrene copolymer.

This work was conducted with a copolymer prepared from 75 parts of butadiene and 25 parts of styrene. The polymer contained about 6% of acetone extractable material consisting largely of phenyl naphthylamines and soap forming acids, particularly stearic acid. It was the general type proposed for large-scale production and characterized by lack of tack, nerviness, and short break, especially when hot.

The general method employed is that described in "Chemistry and Technology of Rubber"[3] and later employed in a modified form by Kemp.[4] In general it consists in the observation with a low power microscope of known amounts of finely divided sulphur dispersed in rubber when very slowly heated and cooled in a hot stage. The solubility temperature is taken as the temperature at which all the sulphur disappears, and the limit of supersaturation is determined by the temperature at which the sulphur reappears when the rubber is slowly cooled.

It was found that the ordinary grade of rubber sulphur, when milled into the polymer, could not be observed satisfactorily. This is due to the almost complete lack of attraction between the sulphur and the polymer. After long periods of milling above the solution temperature much of the sulphur remained undissolved. When small pieces of the polymer sulphur mixture were pressed between cover glasses to a thickness of one or two thousandths of an inch, the polymer in many cases pulled free from the sulphur particle and left a void extending from one glass surface to the other. If this action did not occur during the pressing operation, it occurred when heat was applied; the particle of sulphur remained either in the center of the void or clung loosely to one side of it. Under these conditions the sulphur could be heated to its melting point without dissolving in the polymer. If pressure is applied to the rubber just sufficient to prevent the polymer drawing away from the sulphur, the latter will dissolve and leave a void. Sufficient pressure will, of course, cause the polymer to fill the void as the sulphur dissolves.

A master-batch method was finally employed for the incorporation of sulphur. One hundred parts of polymer and 15 parts of sulphur were well mixed at a temperature above the melting point of sulphur. The hot mixture was then passed between the rolls of a cold rubber mill to chill it and to cause the sulphur to separate through the rubber in extremely fine super-cooled droplets. Many of the droplets crystallize as such, while others migrate and form fine dendritic or trichiten masses through the polymer. These masses readily break up during the milling operation and form particles sufficiently fine that the polymer does not readily separate around them.

This master-batch of sulphur was used to prepare polymer with various amounts of sulphur ranging from one gram in 100 grams of polymer to 10 grams in 100 grams of polymer. Pieces of each of these polymers the size of a pinhead were pressed thin between cover glasses, and the cover glasses and rubber were placed in the hotstage. The cover glasses were supported by a coiled thermocouple having the junction at the center. The heating current was adjusted so that the heating or cooling was at the rate of about 1° C. in five minutes near the critical temperature. A slow rate of temperature change must be maintained because of the slow diffusion of sulphur through the polymer. The temperature at which the droplets disappeared on heating and reappeared on cooling are shown in Table 1 and are represented in Figure 1.

The droplets of supercooled sulphur, if undisturbed, may not crystallize for a considerable time, but if dis-

[1] Director of research, J. M. Huber Corp., 460 W. 34th St., New York, N. Y.

[2] Venable and Green, *Ind. Eng. Chem.*, 14, 319 (1922); Endres, INDIA RUBBER WORLD, 68, 635 (1923); Kelly and Ayers, *Ind. Eng. Chem.*, 16, 148 (1924); Loewen, *Kautschuk*, 4, 243 (1928); Morris, *Ind. Eng. Chem.*, 24, 584 (1932).

[3] Williams in "Chemistry and Technology of Rubber" by Davis and Blake, Reinhold Publishing Corp., (1937).

[4] Kemp, Malm, Winspear, and Stiratelli, *Ind. Eng. Chem.*, 32, 1075 (1940).

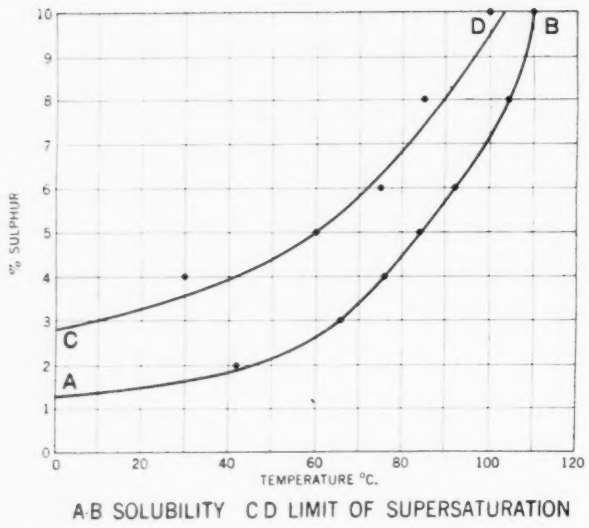


Fig. 1. Solubility and Limit of Supersaturation of Sulphur in Buna S

turbed or seeded, crystallization begins at once. In this case the action is the same as that described for rubber.[3] The supercooled drops dissolve in the polymer and migrate toward the approaching crystal which they serve to feed. The rate of crystal growth probably depends on the rate of solution and migration of the sulphur through the polymer and is a measure of the ease of uniform distribution of sulphur through the polymer. In the case of natural rubber, crystals will easily grow at the rate of one millimeter per minute. However in the butadiene-styrene polymer the crystal growth is not more than 10% so rapid as in rubber. This is partly due to the lower concentration of dissolved sulphur in the polymer, but in most part it is due to the low rate of migration of sulphur through the polymer. This last point is proved by the low rate of extraction of crystals of sulphur from a block of polymer in comparison with the rate of extraction from rubber.

Since the solubility and diffusivity of sulphur in butadiene-styrene copolymer is lower than in rubber, it is more necessary, if uniform vulcanization is to be obtained, to insure a good dispersion of more finely divided sulphur in the polymer. This is especially true of compounds containing large amounts of filler which retard the diffusion of sulphur. This can be accomplished by the use of master-batches prepared above the melting point of sulphur and cooled quickly.

Table 1. Solubility and Limit of Supersaturation of Sulphur in Butadiene-Styrene Copolymer

Grams Sulphur in 100 Grams Polymer	Solution Temperature ° C.	Limit of Supersaturation ° C.
2	42	—
3	66	—
4	76	30
5	84	60
6	92	75
8	104	85
10	110	100

Progress in Synthetic Textile Fibers[1]

RAPID advances in the development of synthetic fibers from thermoplastic resins and protein bases together with advances in coating cotton, rayon, and fiberglass yarns with plastic solutions were reported last month. Vinylidene chloride can be readily polymerized to form long-linear-straight chain polymers, or by careful selection of copolymers and control of polymerization conditions, many different polymers can be formed. These resins range from a flexible, moderately soluble material, having a melting point of about 158° F. to a hard, tough thermoplastic, with a softening point of 350° F. or more. The basic resin is odorless, tasteless, and a non-toxic powder. One of several methods of extrusion is the one of crystal orientation, which produces long continuous monofilaments, tapes, bands, and other shapes. The oriented form is produced by extrusion, and the desired degree of crystallization may be brought about by heat treatment after or during stretching. This process produces monofilament yarns of considerable toughness and tensile strength, abrasion resistance, and chemical resistance to water, acids, alkalies and many organic solvents.

Firestone Tire & Rubber Co. took up the development of these yarns and give them the name "Velon". A production unit was set up at the Worldbestos Plant in Paterson, N. J., where monofilament yarns 0.007-inch in diameter running from 10,000 to 12,000 yards to the pound are being made. Experiments for the extrusion of multifilament yarns are under way, and it is expected that yarns as fine as 100 denier can be produced eventually. One of the present uses for these yarns in is window screens, supposed to provide better vision due to their greater transparency.

Late last year the Vinyon department of American Viscose Corp., besides Vinyon filament yarn, offered a new vinylite resin yarn with considerable elastic properties known as "Vinyon E." It possesses many characteristics of rubber and opens an entirely new field of applications. For some purposes it has exhibited properties better than those of rubber in resistance to sunlight, tropical heat, and humidity and is not affected by body acids.

The National Dairy Products Corp. has made remarkable progress with its trade-named product "Aralac", a casein fiber, offered in finenesses of approximately 50's, 60's, and 70's wool grades and in staple lengths from ½-inch to six inches. Casein fiber is made by a wet spinning process, somewhat similar to viscose rayon. The yarn is not affected by organic solvents and is not thermoplastic below charring temperatures. It withstands sulphuric acid carbonization as well as wool, but its alkali resistance at higher temperatures is somewhat lower.

The process of coating cotton, rayon, and fiberglass yarns with infinitely fine coatings of plastic solutions to give added and almost unlimited strength, brightness or dullness, color, to make them completely waterproof and flame retarding, or resistant to mild acids, perspiration, oil, and grease, is an unusual development assuming considerable proportions and importance in the war effort. The invention of two Frenchmen, Roumazeilles and Girard, it was introduced here in 1939. Improvements in the process in 1942 result in the production of these yarns five times as fast as on the original French machine. It is possible, by varying the number of coatings, to make a plastic-coated yarn as fine as 0.008-inch and up to 0.09-inch in diameter. It is possible to get thread of different shapes such as round, elliptical, triangular, or square. The yarns can be made stiff or soft or any graduation in between. They can be made transparent, translucent, or opaque, smooth or rough, by changing the plastic coating. A "Plexon" wire yarn has been perfected which used non-critical materials both in the support and in the coating. An insect screen using coated cotton yarn has been tested by the Bureau of Standards and found satisfactory.

[1] From a paper by Herbert R. Mauersberger, presented before the A.S.T.M. Committee D-13 at the Park Central Hotel, New York, N. Y., March 11.

Studies in Compounding Guayule Rubber—III [1]

Deresinification of Crude Guayule Rubber . . . .

E. A. Hauser[2] and D. S. le Beau[2]

NON-DERESINIFIED, commercial guayule rubber contains about 26% of a very tacky resin. The physical properties of crude guayule rubber are extremely poor. Upon extraction of the resin, however, the physical properties of the remaining rubber hydrocarbon improve greatly. This extraction is carried out commercially with methyl alcohol as solvent. About 20% of the resin is removed. Recently data[3] on the reactions occurring between the remaining resin and certain compounding ingredients during vulcanization have shown the importance of a more complete and more efficient removal than hitherto practiced.

For that purpose several solvents were tested in laboratory extraction runs. The particular solvents tested were chosen for the following reasons:

1. The solvent should be readily available and inexpensive.
2. The solvent should dissolve only the resin and should permit its quick removal without harmfully affecting the rubber hydrocarbon.
3. The solvent should be easy to recover for re-use.

Extraction with Various Solvents

Methyl alcohol, ethyl alcohol, acetone, 2-nitropropane, furfuraldehyde (commonly known as furfural), ethyl acetate, and nitromethane were tested. Ethyl acetate was found to be unsuitable because it caused excessive swelling of the rubber, and nitromethane was discarded because it proved the least effective.

The extractions were carried out in a standard Soxhlet apparatus. The crude guayule was first passed through a rubber mill twice to obtain a thin sheet. All extractions were carried out at the boiling point of each solvent: acetone, 57° C.; methyl alcohol 65° C.; ethyl alcohol, 79° C.; 2-nitropropane 120° C.; and furfural, 162° C.

These extractions were carried out from one hour to eight hours, and the loss of weight was determined quantitatively at appropriate time intervals. The solvent contained in the samples was removed by keeping the sample in a vacuum dessicator containing a small amount of dry ice. The samples were considered dry if repeated weighing and replacing under vacuum did not change their weight more than 0.0005-gram during a 12-hour period. The loss of weight was then assumed to represent the resin removed from the rubber. Figure 1 shows the loss in weight of 100 grams of crude guayule for different solvents and different time intervals. It can be seen that furfural is by far the most efficient solvent. Acetone follows furfural closely in its efficiency at longer time intervals. At short time intervals, as for example one hour of extraction, acetone lags considerably behind furfural. Eventually 2-nitropropane (after eight hours of extraction) will reach acetone in its efficiency; whereas ethyl—as well as methyl alcohol—are the least efficient in total extraction as well as rate of extraction. Both of these solvents show a flattening of the extraction curve between 18 and 20 grams of resin removed.

Inasmuch as we are not familiar with the structure of the resin, the assumption is justified that methyl- and ethyl alcohol may be capable of dissolving part of the resin only. We are still unable to explain the maximum occurring at four hours of extraction in the ethyl alcohol extraction curve. It should be pointed out, however, that these curves do not really represent the relative extraction powers of the different solvents on a comparative basis because the extraction temperatures varied with the respective boiling points of the solvents. On the other hand seemingly even such extreme boiling point differences as 100° C., occurring between furfural and acetone have little effect on the extraction power of the two solvents.

Influence of Extraction Temperature

As furfural was found to be superior to any other solvent, it was decided to decrease the extraction temperature step by step to ascertain the optimum temperature range, particularly in view of the point that temperatures as high as the boiling point of furfural might seriously affect the properties of the rubber. For such study the Soxhlet extraction apparatus is unsuitable. Therefore the extractions were carried out in a flask equipped with a stirrer and kept in a controlled thermostat set for the desired temperature. Temperatures of 140° C., 75° C., 50° C., and 23-25° C. were investigated.

Figure 2 shows that there is no advantage in using furfural at its boiling temperature since the same results in extraction can be obtained at a temperature of 140° C. If extraction is carried out at 75° C., the efficiency of furfural as solvent must still be considered superior to that of boiling acetone and, of course, to that of the rest of the solvents investigated.

Figure 2 as well as Figure 1 shows clearly the great advantage of furfural as far as its rate of extraction is concerned. One hour of extraction can be considered sufficient for the removal of the resin up to 22 grams (22%). It should be noted here that temperatures below 75° C. are not advisable for extraction purposes. It has been observed that from 75° C. upward the furfural seems to exert some slight swelling action on the guayule rubber. This swelling will tend to facilitate the dissolution of the resin, in the solvent.

Influence of Time of Extraction

To investigate the very first part of the time-extraction curves of Figures 1 and 2 in greater detail, experiments were conducted over a range of one hour and only at temperatures of 90° C. and 75° C.

Figure 3 shows that already within the first 20 minutes of extraction more than 21% of the resin has been removed, and that from approximately 40 minutes on the amount of resin extracted does no longer change appreciably with time. Although at temperatures above 90° C. the rate of extraction might still be somewhat higher, it was feared that such high temperatures may cause a breakdown of the rubber hydrocarbon.

To prove this point about 500 grams of crude guayule

[1] This paper is based largely on data taken from the Bachelor of Science thesis of William G. Louden, Department of Chemistry, Massachusetts Institute of Technology, Cambridge, Mass. (1943).
[2] Massachusetts Institute of Technology.
[3] Hauser and le Beau, India Rubber World, 106, 5, 447 (1942); 107, 6, 568 (1943).

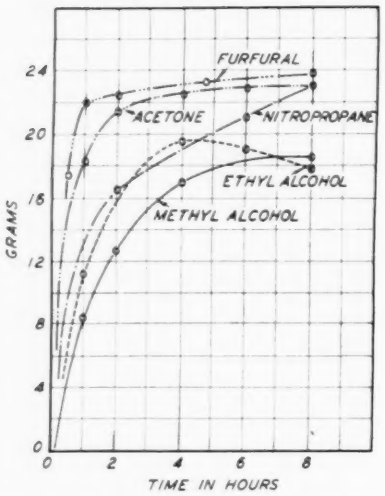


Fig. 1. Grams of Guayule Resin Extracted with Various Solvents at Boiling Point

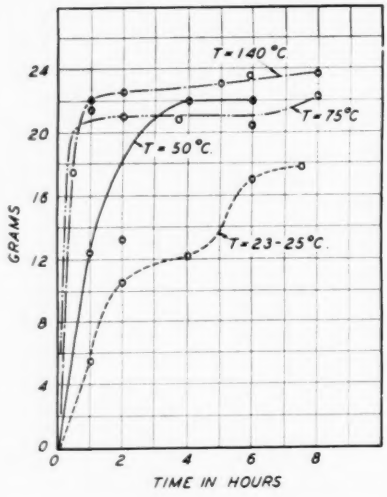


Fig. 2. Grams of Guayule Resin Extracted with Furfural at Various Temperatures

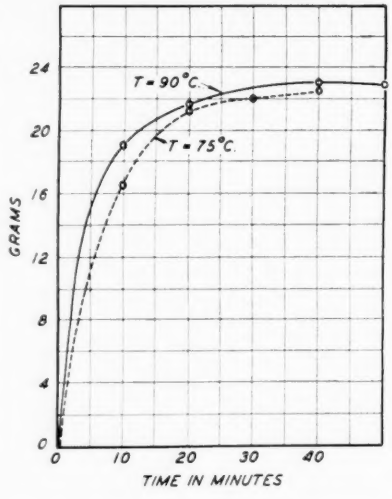


Fig. 3. Grams of Guayule Resin Extracted with Furfural—Effect of Time of Extraction

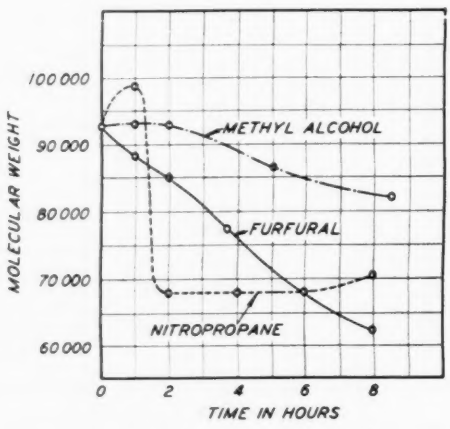


Fig. 4. Effect of Time of Extraction on the Molecular Weight With Different Solvents

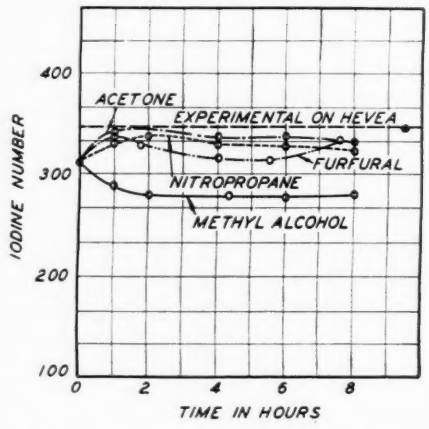


Fig. 5. Effect of Time of Extraction With Different Solvents on Unsaturation

were extracted in boiling furfural for one hour; the solvent remaining in the rubber was removed by steam distillation. The rubber was then resheeted, an antioxidant was added immediately, and the rubber sheet dried in air. The dry sheet was then compounded on a warm mill (140° F.) according to the following standard formula:

Grams	
100	Rubber
5	ZnO
1	Captax
1	Stearic acid
3	Sulphur

Since previous experiments on guayule rubber had shown the necessity of increased amounts of stearic acid, a second compound was prepared identical with the above, but containing four parts of stearic acid instead of one part. Two blank compounds of exactly the same formulation, but with the commercially deresinified guayule containing 6% resin, were also prepared. All compounds were vulcanized at 270° F. No change in the rate of cure could be observed between the two compounds prepared from furfural extracted guayule and the two compounds prepared from commercially deresinified guayule. Table 1 shows the physical properties of the four compounds at optimum cure.

TABLE 1

Compound Containing	Solvent Used for extraction	Tensile at Break lbs./in.²	% Elongation
1 part stearic acid	Furfural	3500	710
4 parts stearic acid	Furfural	3900	660
1 part stearic acid	Commercially deresinified (methyl alcohol)	2350	790
4 parts stearic acid	Commercially deresinified (methyl alcohol)	3400	700

Contrary to what might have been expected, it can be clearly seen that the temperature of extraction with furfural (162° C.), at least within the time limit investigated, has no ill effects on the rubber hydrocarbon. Furthermore the more complete removal of the resin which can be obtained by this method improves the physical properties. Tensiles are obtained with one part stearic acid which are by far superior to those obtained from the same compound prepared from commercially deresinified guayule. Also, the ultimate tensiles obtained with four parts stearic acid and furfural extracted guayule are superior to those obtained from the same compound prepared from commercially deresinified guayule.

Influence of Antioxidant

It should be pointed out here that guayule rubber seems

extremely sensitive to the influence of antioxidants. Commercially deresinified guayule, which has been used in the present and all previous investigations, contains antioxidant. Experiments on the purification of guayule rubber by precipitation of the rubber hydrocarbon (from benzene solution) with ethyl alcohol have shown that the pure rubber hydrocarbon obtained in this way is extremely unstable and will revert to a soft flowing sticky mass if stored in contact with light and air. Thus it seems advisable to add an antioxidant as soon as the extraction of the resin is completed; or if the antioxidant is insoluble in the solvent used for extraction, it might preferably be added before extraction is started.

Effect of Extraction on the Molecular Weight

To determine further the effect of the extraction on the rubber hydrocarbon, determinations of its molecular weight were carried out. Although the determinations of the physical properties of guayule rubber extracted for one hour at the boiling point of furfural have indicated that no marked change in the rubber hydrocarbon could have occurred, it was considered advisable to expand this investigation to longer times of extraction as well as to the different solvents used.

The guayule rubber was extracted in a Soxhlet apparatus at the boiling temperatures of the various solvents. At certain time intervals of extraction samples were removed, dried to constant weight, and then dissolved in benzene. The solution was precipitated in ethyl alcohol, and the vacuum dried rubber redissolved in benzene. After the second alcohol precipitation benzene solutions of various concentrations were prepared for the determination of the relative viscosities, and the modified Staudinger formula $M = \frac{\log \eta}{K_m C}$ was applied. Since it had been shown that guayule is subject to quick breakdown on the mill, and since all the samples tested had been passed through the mill twice to obtain a sample suitable for extraction, it seemed more appropriate to use Staudinger's constant $K = 1 \times 10^{-4}$ rather than the one suggested by Kemp and Peters.[4]

Figure 4 shows the influence of the time of extraction on the molecular weight for various solvents. Extraction with methyl alcohol up to two hours does not seem to affect the molecular weight. From then on a steady decrease in the molecular weight can be noticed until after eight hours of extraction it drops to 88% of its original value; whereas the amount of resin extracted after six hours does not amount to more than 17% and after eight hours to 18.5%. The molecular weight of guayule rubber extracted with 2-nitropropane drops rapidly in the second hour of extraction to 73% of the original value and then does not change any more to all intents and purposes. This drop in the molecular weight occurs at a time of extraction when only slightly more than 16% of the resin has been extracted. The curve representing the progress of extraction with furfural shows a drop in the molecular weights of only 5% after one hour of extraction and 33% after eight hours. The latter is the lowest molecular weight recorded in this series. However after one hour of extraction with furfural 23% of resin has been removed, and further extending of the extraction is unnecessary. The physical data of the compounds have shown that the 5% drop in molecular weight does not have any serious effect on the tensile strength of the rubber.

But it should be pointed out that the above determinations of the molecular weights may not represent the actual molecular weights. As previously mentioned, there seems to be a portion of the resin which is insoluble in alcohol and therefore might still be present in the reprecipitated rubber. Thus we may expect the molecular weight of pure guayule rubber to be somewhat higher than recorded.

A comparison of the molecular weights as determined for guayule with those of *Hevea* rubber, coupled with the fact that the tensile strength of pure gum stocks of *Hevea* and guayule are practically the same, seems to indicate that chain length of the polymer alone is not responsible for tensile strength.

It must be kept in mind, however, that such molecular weight determinations and data represent the average distribution of the various chain lengths present in the particular rubber. It is quite possible that the guayule hydrocarbon, although having a certain amount of chains of possibly the same length as *Hevea* rubber, may possess an average distribution of chain size entirely different from that of hevea rubber. The work of Hauser and Brown[5] on the determination of the loss of unsaturation during vulcanization seems to point to the assumption that sulphur combination and the resultant comparatively small loss of unsaturation cannot be considered as the sole reaction occurring during vulcanization and the only one responsible for the tremendous changes in the properties of the rubber during and after that period. It is conceivable that during vulcanization also certain physical changes may occur, which cannot be ascertained by chemical analysis. This would explain why the molecular weight of the polymer alone might not be held responsible—within certain limits—for the tensile properties of the vulcanized product obtained from it, provided, of course, that polymers are compared whose chemical and physical structure are essentially the same.

The decrease in the molecular weights during extraction can be explained by a breakdown of the molecules because of the prolonged action of heat. The possibility of oxidation occurring during that period cannot be disregarded completely. It will, however, be extremely difficult to prove this point experimentally.

Determination of Unsaturation

Finally it was thought of interest to compare the iodine number of guayule rubber with that of *Hevea* and to ascertain, if possible, whether the extraction exerts any influence on unsaturation. The method used for this purpose was discussed in detail by Hauser and Brown.[5]

Figure 5 shows the effect of various solvents as well as the effect of the time of extraction on the unsaturation of guayule rubber.

The initial rise in the unsaturation noticeable for all solvents except methyl alcohol can be explained by the removal of the greater part of the resin during the first hour of extraction. The assumption that part of the resin is insoluble in alcohol and hence not removed during purification seems justified. This point is further substantiated by the fact that the maximum unsaturation occurs in each case when the extraction curves (Figure 1) flatten off. Although prolonged extraction results in a great change in the molecular weight for most solvents investigated, it can be noticed that the unsaturation is hardly affected.

The curve for the unsaturation of guayule rubber extracted with methyl alcohol records the smallest iodine numbers. This again can be explained with the assumption that methyl alcohol dissolves only part of the resin.

There remains the question if the resin itself might affect the unsaturation of guayule rubber at elevated tem-

(*Continued on page 44*)

[4] A. R. Kemp and H. Peters, *Ind. Eng. Chem.* 33, 1391 (1941).

[5] *Ibid.*, 30, 1291 (1938); 31, 1225 (1939).

Variables and Suggested Modifications In Accelerated Light Aging[1]

C. K. Chatten[2] and T. A. Werkenthin[3]

A COMPREHENSIVE study of the equipment and the methods used for making accelerated light aging tests was undertaken by T. A. Werkenthin and co-workers.[4] The light aging apparatus was described in detail, and a method for determining the intensity of the light source was given. J. H. Ingmanson,[5] in his report to Committee D-11, presented data on the accelerated light aging and outdoor weathering resistance of five typical elastomeric compounds as determined by five different laboratories. A reasonable degree of correlation between natural and accelerated light aging results was reported. It was found, however, that the procedure for making accelerated light aging tests was not sufficiently standardized to permit satisfactorily comparable results between the participating laboratories.

The purpose of this article is to present data on the effects of angular as compared to vertical exposure of specimens in the light aging unit and to show the degree of variation in temperature and light intensity between the upper and lower levels of the unit using the angular exposure method.

Variables Due to Position of Specimens in Unit

Specimens of a given rubber material hung vertically in the upper level of the light aging unit almost always show a greater degree of deterioration in a given time than do like specimens hung vertically in the lower level of the unit. In addition, like specimens hung vertically in the same level are not always deteriorated to the same degree per unit of time. This lack of correlation is believed to be due to (1) a higher aging temperature occurring in the top level, and (2) greater intensity of light radiation striking the ends of the specimens nearest to the carbon arc. The second variable may be minimized by angular exposure of the specimens in both levels. In this connection C. G. Ollinger[6] has recommended that the specimens be exposed to the carbon arc at an angle of 18 degrees to the vertical, and with the radius from the arc center to the center of the specimens at 12½ degrees from the horizontal. This recommendation was based on the overall calibration of the radiation intensity striking the samples. Figure 1 shows the specimen frames mounted at the above calculated correct angle to the carbon arc, and the spray nozzles centered with respect to the exposed specimens. Figure 2 shows the adjustment of the spray nozzles for angular impingement of the spray on the specimens.

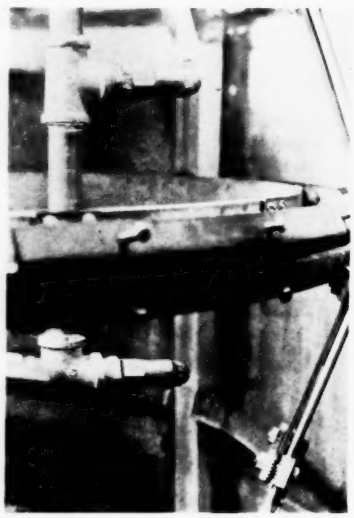


Fig. 1. Spray Nozzles Mounted for Angular Impingement

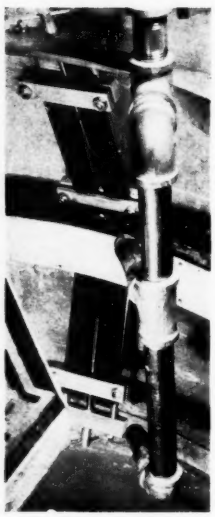


Fig. 2. Specimen Frames at Correct Angle

Comparison Between Vertical and Angular Exposure of Specimens

A considerable number of angular *vs.* vertical exposure tests were made, using a variety of *Hevea* rubber compounds. As typical examples, the results of tests of a carbon black loaded stock, a gum stock, and a gum stock containing a protective wax were included for purposes of comparison. In the first test the samples were mounted vertically in both levels of the light aging unit. In the second test the samples were mounted at an angle of 18 degrees to the vertical. In both tests the samples, at 10% elongation, were exposed to radiation from the bare "Sunshine" carbon arc for 12 hours. All test procedures were in accordance with the methods described in Federal Specification ZZ-R-601a.

The equalizing effects of angular mounting of the specimens are shown by the results of tensile tests, Table 1. Although angular exposures in both levels of the unit resulted in less variation in tensile properties of the material than with vertical exposures, the specimens exposed in the upper level were deteriorated to a greater extent with angular as well as vertical exposures.

TABLE 1. TENSILE TEST RESULTS—VERTICAL AND ANGULAR EXPOSURE

	Carbon Black Loaded Stock	Gum Stock	Gum Stock with Wax
Initial T. S. p.s.i.	1977	3360	3280
Initial elongation, %	375	850	850
Tensile strength, vertical exposure			
Upper level, p.s.i.	330	*	830
Lower level, p.s.i.	545	1495	1190
Elongation, vertical exposure			
Upper level, %	188	*	700
Lower level, %	238	725	700
Tensile strength, angular exposure			
Upper level, p.s.i.	1309	675	1000
Lower level, p.s.i.	1403	1112	1286
Elongation, angular exposure			
Upper level, %	288	600	700
Lower level, %	275	700	700

* Broke during exposure.

[1] The opinions or assertions contained herein are the private ones of the writers and are not to be construed as official or reflecting the views of the Navy Department or the Naval service at large.
[2] Associate rubber technologist, Material Laboratory, Navy Yard, New York, N. Y.
[3] Senior materials engineer, Standards and Tests Section (Petroleum and Chemical Group), Research Branch, Design Division, Bureau of Ships, Washington, D. C.
[4] INDIA RUBBER WORLD, Nov. 1, 1941, pp 143-46; Dec. 1, 1941, pp. 264-68.
[5] Report of Committee D-11 on Rubber Products, 1942 ASTM Preprint No. 69.
[6] Unpublished correspondence, C. G. Ollinger, carbon sales division, National Carbon Co., Inc., Cleveland, O.

Variations in Temperature and Light Intensity In Eveready X-1A Unit

METHOD OF TEST. Since specimens angularly exposed in the upper level of the light aging unit were somewhat more severely aged than specimens similarly exposed in the lower level, quantitative tests were made to determine the variations in temperature and light intensity occurring at both rack levels.

The differences in temperature were determined by measuring the ambient air temperature at both rack levels, and the interior and surface temperature of each of two *Hevea* rubber black hose cover specimens, angularly mounted and exposed to radiation from the bare "Sunshine" carbon arc. One specimen was mounted in the top rack, and the other specimen was symmetrically located in the bottom rack. In order to determine the interior temperature of the rubber, each specimen was prepared by sealing an iron-constantan thermocouple in the slit edge of a one-inch by six-inch sample of the material. The thermocouple lead wires were conducted from the point of exposure, under the frame of the revolving rack and out through the opening at the bottom of the unit. The leads were wired through a six-point multiple switch to a potentiometer-type pyrometer. Temperature readings were taken every five minutes during a complete revolution of the rack. The surface temperature of the rubber and the ambient air temperature in the unit were measured by the use of thermocouples placed in direct contact with the exposed surface, and located ½-inch in front of the exposed surface of each specimen, respectively.

Light intensity and cumulative light dosage in the unit were evaluated by simultaneous exposure of two actinometer cells, one cell located in the top rack and the other cell symmetrically located in the bottom rack. The cells were inclined at the proper rack angles for exposure to radiation from the bare "Sunshine" carbon arc. Actinometer exposures were made for periods of exactly 15 minutes, at 15-minute intervals during the two-hour revolution of the rack. The exposed actinometer solutions were analyzed, using the procedures described in Federal Specification ZZ-R-601a.

In this test light intensity is expressed as milligrams of oxalic acid decomposed per square decimeter per minute based on 15 minutes' exposure of the cell. The light intensity is not likely to be the same for each minute during the 15-minute period, owing to variations in the arc, but the average is representative within reasonable limits.

Light dosage for the 15-minute period is expressed on the basis of milligrams of oxalic acid decomposed per square decimeter for 15 minutes, or for 45 degrees of rotation of the exposure rack. Cumulative light dosage at any time is then the sum of the preceding 15-minute exposure values.

RESULTS OF TEST. Changes in temperature occurring in the top and bottom rack levels of the unit are shown respectively on the graphs, Figure 3. Since it was not practicable to make temperature readings at less than five-minute intervals, the points plotted do not indicate all instantaneous values. It is apparent that all temperature readings at the top rack level were higher than at the corresponding position on the bottom rack. Furthermore, in comparing the rubber and ambient air temperatures for exposures made at the same rack level, it is apparent that the greatest differential occurs at the point of highest ambient air temperature. The minimum temperatures of the rubber specimens and the ambient air were obtained under the water spray.

The changes in light intensity at 15-minute intervals during the two-hour light aging cycle are shown on the graph, Figure 4. It is apparent that light intensity varied

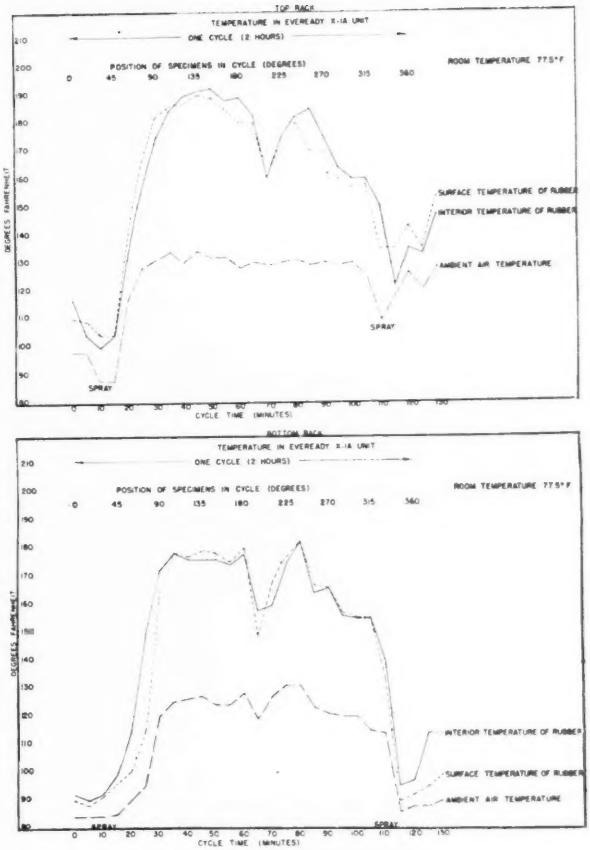


Fig. 3. Temperature during Test

in approximately the same degree in the top and bottom racks at the various positions in the cycle. Some of the variation occurring at either rack level may be due:

(a) Differences in distance from the arc to the actinometer cell due to intermittent change of location of the arc between the two pairs of carbons.

(b) Shielding of the carbon arc by the vertical carbon holder guides.

(c) Shielding of the carbon arc by the formation of an overhanging lip on the upper carbon.

The minimum light intensity occurred under the water spray.

A lower rate of oxalic acid decomposition under the spray may be due to:

(a) Shielding of the exposed surface of the actinometer cell by the spray.

(b) Shielding of the exposed surface of the actinometer cell due to condensation of moisture on the cell surface.

(c) Lower rate of decomposition of the actinometer solution due to cooling of the solution by the spray.

Decomposition of the actinometer solutions varied from 7% to 28.1%, depending upon the location of the cell in the cycle. The decomposition of 7% was for the position of least light intensity.

The graph, Figure 5, shows the cumulative light dosage at both rack levels throughout the two-hour light aging cycle. In this test it appears that, at any point in the cycle, the light dosage was higher in the bottom than in the top rack of the unit. However, since the variations in cumulative light dosage at the two rack levels are of the same order, it is apparent that light dosage can be equalized by elevating the position of the carbon arc in the unit.

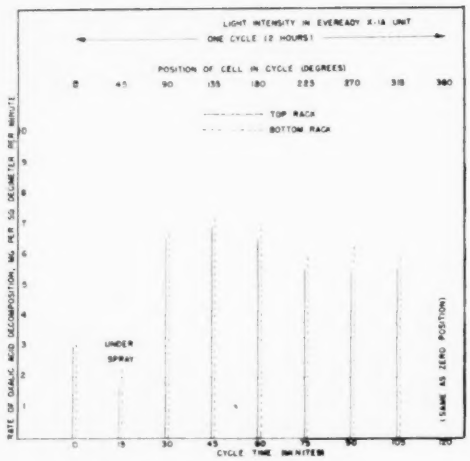

LIGHT INTENSITY IN EVEREADY X-1A UNIT
ONE CYCLE (2 HOURS)
POSITION OF CELL IN CYCLE (DEGREES)
0 45 90 135 180 225 270 315 360
TOP RACK
BOTTOM RACK
UNDER SPRAY
(SAME AS ZERO POSITION)
CYCLE TIME (MINUTES)

Fig. 4. Light Intensity during Test

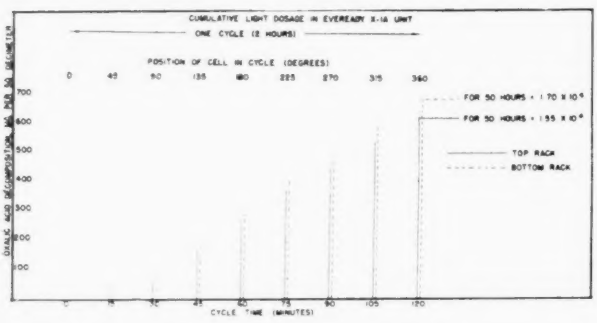

CUMULATIVE LIGHT DOSAGE IN EVEREADY X-1A UNIT
ONE CYCLE (2 HOURS)
POSITION OF CELL IN CYCLE (DEGREES)
0 45 90 135 180 225 270 315 360
FOR 50 HOURS = 1.70 X 10⁶
FOR 50 HOURS = 1.55 X 10⁶
TOP RACK
BOTTOM RACK
CYCLE TIME (MINUTES)

Fig. 5. Cumulative Light Dosage during Test

Conclusions

Analyses of the conditions in the light aging exposure cycle indicate that there are wide differences in aging effects between the two rack levels when the specimens are exposed vertically. However a substantial degree of equalization in light aging effects can be obtained by angular exposure of specimens on both racks.

There are variations in temperature, light intensity, and cumulative light dosage throughout the two-hour period of rotation of the angular specimen racks, and variations of similar order occur at both rack levels.

There is an appreciable difference between the measured temperature of specimens symmetrically located in the top and bottom racks of the unit; the specimens on the top rack are subjected to a higher aging temperature.

In order to obtain the maximum degree of correlation in light aging results for specimens angularly mounted on both racks, it appears necessary to maintain a uniform temperature in the unit.

The above conclusions are based on the results of tests of specimens of the same thickness and surface characteristics. Other variables which may influence the light aging of rubber materials are:

(a) Thickness and surface condition of exposed specimens (whether buffed or glossy).

(b) Temperature of the water spray.

(c) Volume of water used per unit of time.

(d) Impurities in the water spray.

Summary

Angular instead of vertical mounting of specimens will result in a fairly uniform degree of deterioration of like specimens mounted in both levels of the unit.

It appears that the test procedure should be standardized as to allowable maximum and minimum temperatures at both levels of the unit; thickness and surface condition of the specimens; and temperature, volume, and purity of the water spray.

The authors wish to thank Lieutenant (jg) R. P. Devoluy and H. Nestlen for their advice, and J. Riseman for his assistance in carrying out this work.

Chain Drive Advantages

"I NEVER thought of that," said a big user of power transmission equipment when it was pointed out to him that the cost of installing chain drive is often practically nothing; whereas the cost of installing other types of drives is sometimes surprisingly high. Most high-grade chains can be installed by common labor without the use of any special equipment.

So, believing that many others "never thought of that" and believing that they are unacquainted with some of the other important advantages of chain drives, the writer decided to sum up briefly the principal advantages offered by high-grade chains as compared with other types of drives. Here they are:

Chains provide a positive and unvarying ratio. They make it possible to compute accurately the driven speed if the speed of the driver is known. Chain efficiency is high; in fact the efficiency is usually so close to 100% that the inefficiency is unimportant. The first cost of chain drive is moderate. In the final cost must be reckoned the freedom from "dead" machine time, the favorable effect on overhead "rental" due to the small requirements for floor space in comparison with some other types, the simplicity of installation, and low maintenance. Chain drives have great strength and durability. Chain drives do not "wedge" or bind. Chain drives do not require "wrapper pulley mountings."

Center distances as great as 15 feet for drives from electric motors are entirely practical as has been proved by numerous successful installations. When speeds are lower, center distances of 30 to 40 feet are not impossible, although the design of such drives naturally requires more care than when requirements are not so unusual.

Roller chains are symmetrical. They have no right or wrong side and are reversible. The use of one driving sprocket with three or four followers and two or three idlers for controlling the path of the chain is not unusual.

The writer was recently informed of an instance where power was to be taken from a 1500 h.p. engine to two heavy line shafts driving rubber mills. The rubber mills were in place, the shafting was in place, and various forms of transmission were carefully considered by the engineers. If a rope drive had been used, it would have meant remodeling the building, sacrificing valuable space for the tightener carriage and large sheaves. If gears had been used, it would have been necessary on account of center distances to install a train of three gears, which would have been very noisy; the efficiency would have been poor, and the cost of the three gears would have been more than for chain drive. Silent chain drives were installed, and they figured less in first cost than either the gear or the rope drive. The engineers decided that a belt drive was out of the question. This installation was made about 19 years ago and is still running successfully with only natural repairs.

Witcogum — New-Type Chemurgic Rubber

C. S. Yoran[1] and W. I. Harber[1]

WITCOGUM, a new type of chemurgic rubber, is a development of Witco Laboratories, a unit of Wishnick-Tumpeer, Inc. This new product, having successfully passed through months of experimental development, progressed into commercial production, and earned acceptance in the rubber industry, has a wide application as a replacement for rubber or reclaim in certain products where maximum physical properties are not required. It cannot be used for automobile tires or similar products, but it can be used where a rubber-like material in the low tensile strength and low elongation range will suffice.

Unlike Norepol, no critical materials or critical equipment enter into the manufacture of Witcogum. The vegetable oils used in the material are of the non-edible type, and the equipment necessary is entirely on the non-critical list.

Witcogum is a resilient, dark colored, spongy material which may be processed on standard rubber mills and internal mixers. Calendering, extruding, and vulcanization may be done in regular rubber equipment.

Compounding Procedure

All the necessary vulcanizing ingredients are contained in Witcogum, but it may be loaded and softened to meet requirements. The material contains accelerators of the guanidine and thiazole type and sufficient sulphur to give a cure in 30 minutes at 40 pounds steam or 10 minutes at 60 pounds steam. If faster cures are desired, higher temperatures and the addition of more accelerators are suggested. Additional sulphur should not be used since it will cause bloom and blistering.

Standard rubber pigments in moderate loadings may be used to raise the tensile strength, but higher loadings, especially of carbon black, will show increased tendency to crack when flexed sharply. Tensile strength as high as 450 pounds per square inch may be obtained and elongation as high as 150%.

An example of a typical compound and its properties is given below. Milling and tubing operations with this compound are shown in the illustrations.

Witcogum	100
Witcarb (precipitated calcium carbonate)	30
Cure: 30 min. at 40 lbs. steam or 10 min. at 60 lbs. steam	
Tensile strength:	300 to 350 lbs. per sq. in.
Elongation:	140 to 150%
Hardness (Shore):	60 to 65
Tear resistance:	45 to 50 lbs. per inch

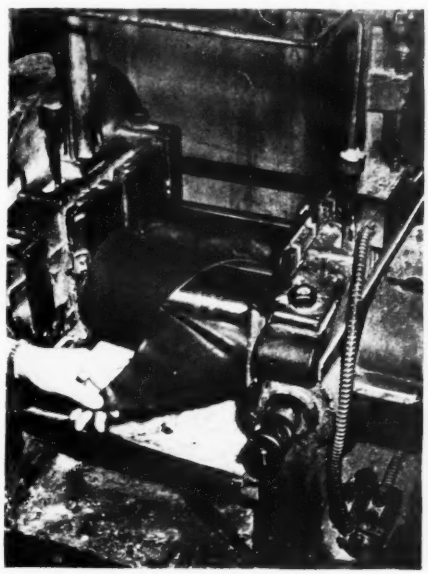
Softeners such as fatty acids, soft coumarone-indene resins, and rosin may be added to increase tack, improve processing and molding and give a more homogeneous product. It is important that sufficient softener be added to the mix when Witcogum is to be calendered on fabric. Antioxidants appear to have little effect on accelerated aging tests.

Processing Procedure

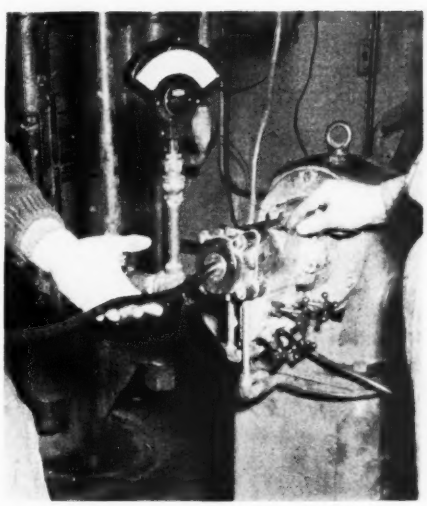
Mixing on mill or mixer should be done with cold water passing through the rolls. Witcogum should be passed through the mill several times until a smooth sheet is obtained and cut and blended thoroughly before pigment is added. Best results appear to be obtained by adding pigment first and softeners after the pigment is well mixed into the batch.

Calendering and extrusion may be used to prepare stock for molding. Calendering temperatures should be lower than rubber to avoid sticking. Extrusion with warm die and cool cylinder is recommended.

Curing may be carried out in a press, dry heat or open steam. Mold lubricants of soluble wax type have proved of aid in removal from molds. Cured pieces are tender while hot and removal from molds must be done with care.

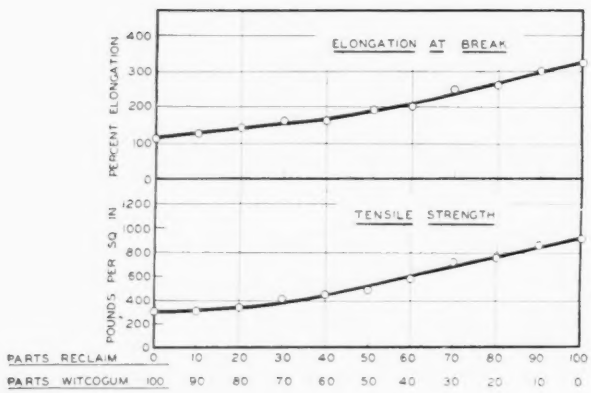


Witcogum Mills Like Rubber



Extruding Witcogum on Standard Rubber Equipment

[1] Wishnick-Tumpeer, Inc., Research Laboratory, Chicago, Ill.


ELONGATION AT BREAK
PERCENT ELONGATION
TENSILE STRENGTH
POUNDS PER SQ IN
PARTS RECLAIM 0 10 20 30 40 50 60 70 80 90 100
PARTS WITCOGUM 100 90 80 70 60 50 40 30 20 10 0

Physical Properties of Witcogum-Reclaim Blend

Use with Reclaim

Although Witcogum is designed primarily for use alone, it may also be blended with rubber, reclaim, or synthetic rubber to improve processing or to extend these elastomers. The use of Witcogum with reclaim to improve processing is particularly interesting since it serves to soften and smooth out a batch without increasing tackiness. The improvement obtained more than compensates for the reduction in tensile strength.

The physical properties which result when Witcogum is used to extend reclaim are summarized in Table I and the accompanying chart.

TABLE I

	A	B	C	D	E	F	G	H	I	J	K
Whole tire reclaim	0.	10.	20.	30.	40.	50.	60.	70.	80.	90.	100.
Witcogum	100.	90.	80.	70.	60.	50.	40.	30.	20.	10.	0.
Clay	30.	30.	30.	30.	30.	30.	30.	30.	30.	30.	30.
Stearic acid	0.	0.2	0.4	0.6	0.8	1.0	1.2	1.4	1.6	1.8	2.0
Mercaptobenzothiazole	0.	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
Sulphur	0.	0.2	0.4	0.6	0.8	1.0	1.2	1.4	1.6	1.8	2.0
Tensile strength Elongation (%):	110.	130.	140.	160.	160.	190.	200.	250.	260.	300.	320.
(psi):	300.	300.	330.	400.	440.	480.	570.	700.	740.	840.	900.

Effect of Solvents and Chemicals

The effect of solvents and chemicals on Witcogum is in general similar to their effect on rubber. Water and alcohol have no apparent effect. Petroleum solvents, aromatic solvents, acetone, and ester solvents cause swelling with consequent brittleness and loss of strength.

Conclusion

Witcogum is offered as a replacement for rubber and reclaim only in products which do not require high tensile strength, elongation, abrasion resistance, or flex-cracking resistance. It is being used by manufacturers of extruded channels, foot comfort pads, hospital sheeting, brake linings, jar rings, hose and tubing, wire insulation, stationer's goods, mats and pads, gaskets, grommets, and shims. Its consumption for these and other products releases for more essential purposes rubber, reclaim, and synthetic rubber.

Compounding Guayule

(*Continued from page 39*)

perature. Therefore non-deresinified guayule was placed into an oven at 92° C., and samples were removed at certain time intervals, and the unsaturation determined. No change in unsaturation could be detected. The unsaturation of the extracted guayule resin corresponds to an iodine number of 117. That the iodine number does not change over a long period of extraction is not surprising.

Two possibilities of breakdown of the rubber chains can be envisaged. The chain can either split close to the ends, leaving a long chain with one or two short residual chains, or it can split near the middle, resulting in two still comparatively long chains. In the former case the change in molecular weight determined should be small in comparison to the latter. The change in unsaturation will be more pronounced in the former case. The experimental methods applied in this investigation unfortunately do not permit a statement if oxidation or simple thermal breakdown of the chains is responsible for the drop in molecular weight recorded.

Conclusion

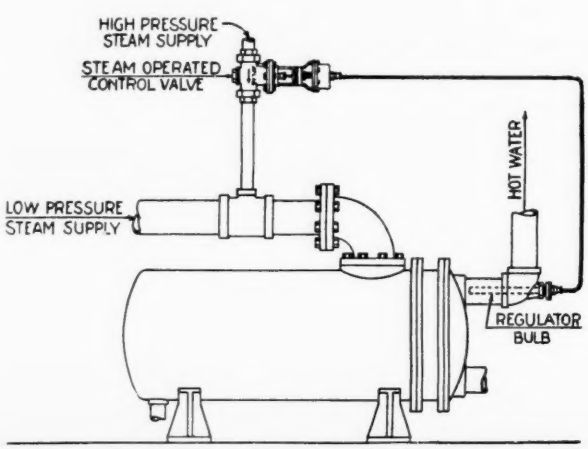
It has been shown that different solvents used in the extraction of the resin from crude guayule exhibit different time-temperature relations.

Of all the solvents tested furfural has proved to be the most efficient solvent for its speed and amount of resin extracted. It does not affect adversely the properties of the hydrocarbon.

Getting the Most from Exhaust Steam

EVERY effort should be made to utilize exhaust steam rather than allow it to go to waste. Exhaust steam contains nearly as much heat as high pressure steam; therefore it is nearly as valuable. In the event that there is not enough exhaust steam for one's purpose, it is usually a simple matter to secure the desired result at all times by means of supplementary heat and properly arranged regulating devices.

The accompanying sketch shows an inexpensive piping arrangement and regulator hook-up for economically maintaining uniform water temperature. When the supply of exhaust steam is ample, the high-pressure steam control valve remains closed, and live steam is not used. However, as soon as there is the slightest decrease in water temperature, the temperature regulator automatically opens the steam valve and admits live steam to the heater along with the exhaust. Then as soon as normal temperature is reached, the steam valve automatically closes.



The Plasticization of Buna[1]

Harro Hagen

THE usefulness of natural rubber for special purposes is due to its plastic behavior as raw material and its elastic properties as working material. By contrast, buna is not thermoplastic as a raw material and less easily masticated. Buna carbon black vulcanizates are similar in quality to those of natural rubber so that the Buna problem was not so much one of quality as of processing. Compared with natural rubber the processing of buna had several disadvantages in regard to plasticity, adhesiveness, extradurability, union of plies, in solubility, and the manufacture of dipped goods so that the capacity of the machines was lower than with natural rubber, and a higher percentage of waste had to be taken into account.

Up to about a year ago it was attempted to overcome the difficulty of achieving the necessary degree of plasticity in buna mixes, by mastication or by the addition of large amounts of softener. The prolonged milling necessary was expensive and yielded a certain measure of success only when technically perfect modern mills were used, as buna is relatively hard to mill. The softeners did indeed help to facilitate processing, but at the cost of some deterioration in quality, for the softener, being a foreign body, when used in large amounts, had an injurious effect on high-grade finished goods.

Since that time oxidative thermal softening of buna has come to the fore, a process which has also been called "degradation", a not too happily chosen term which suggests a technical deterioration in quality. Properly speaking, there is such a loss in quality, just as in the case of natural rubber there is a not inconsiderable deterioration in quality when the latex is converted to dry rubber, a deterioration made still more extensive by mastication. Thus while it is possible under laboratory conditions to obtain a tread compound with tensile of 300-350 kg./sq.cm. (4267-5000 lbs./in.^{2}) from natural rubber and a latex compound with tensile of 450-500 kg./sq.cm. (6430-7140 lbs./in.^{2}), the values obtainable with milled natural rubber in mechanical compounds are considerably lower. Despite this one would not wish, except in the rarest instances, to dispense with the milling of natural rubber since its processibility depends on the plasticization connected with mastication.

Thermal softening of Buna S corresponds to the mastication of natural rubber. It has been possible to produce treads of non-softened Buna S with tensile of 300 to 320 kg./sq.cm. (4267-4550 lbs./in.^{2}) from compounds prepared in the laboratory, but these results cannot be obtained on factory mills because of the poor distribution of fillers. With thermal softening, the tensile obtainable for tread compounds made on laboratory mills would, to be sure, be somewhat lower, 280-290 kg./sq.cm. (3980-4150 lbs./in.^{2}). In mechanical compounds the improved distribution of fillers, as compared with non-softened Buna S, would cause an increase in tensile.

Oxidative softening is justified not only from a processing and technical point of view, but essentially because of the improvement it produces in the finished product—provided, of course, that the degree of softening is suited to the intended application and that the optimum formula has been worked out. It would therefore be better to replace the derogatory word "degradation" by "oxidation" or "thermal softening."

THIS article, although published more than four years ago in Germany, is one of the best available that will give an insight into the technology of using Buna S as it was known in Germany at that time. It is felt that the complete translation presented here, including the graphs and tables, might be of considerable value to rubber technologists of this country in their efforts to find the most suitable methods for processing the similar, but not identical GR-S or American Buna S. It is also planned to have translations of other articles published in Germany during 1940 and 1941 on German Buna S appear in INDIA RUBBER WORLD in the near future.
EDITOR'S NOTE.

Advantages and Disadvantages of Oxidative Softening

As compared with the non-softened material, thermally treated Buna S has a number of advantages and disadvantages which will first be enumerated and then discussed. It is obvious that change depends on the degree of softening and equally so that a Buna S that has been softened too much, like natural rubber that has been overmilled, has slight value in rubber manufacture.

The chief disadvantages of thermal softening are:

There is a decrease in the elasticity of the vulcanizate which can only with difficulty be corrected by compounding when softening has been carried to an advanced stage, and the working power of the vulcanizates declines. Buna S is not so readily vulcanizable and thus requires a higher percentage of sulphur and accelerator, and when this percentage is not carefully adjusted, aging, heat resistance, and fatigue suffer. Greater care is therefore required in working out formulae.

The advantages of thermal softening are:

The power required for mixing, the mixing time, and the size of the pieces are on the same level as in the case of natural rubber. The capacity of the mills, therefore, remains practically the same when buna instead of natural rubber is employed so that thermal softening reduces the cost of milling as compared with that for untreated buna. The distribution of fillers is improved so that mixing is more complete, and there is less waste. The mixes can be more easily fashioned, and extrusion especially is facilitated. The tackiness of the compound is raised but still remains below that of natural rubber. Softening makes shearing in the cable industry possible. Where thermal softening eliminates the need of large amounts of softeners (plasticizers), there is an improvement in quality.

With a more advanced degree of softening, the kneading machines can be used; kneaded compounds are very often considerably more favorable than milled compounds in regard to the final physical test values, but more especially in regard to facility of extruding and calendering.

The preparation of benzene solutions is facilitated because without thermal softening adequate solubility can only be obtained after very prolonged mastication. The viscosity of the solutions is lower; so higher concentrations can be used.

Process of Oxidative Softening

Softening is brought about by heating buna in the presence of oxygen or air. The degree of softening is very materially influenced by the variables: temperature, time,

[1] Translated from *Kautschuk*, Nov., 1938, pp. 203-10.

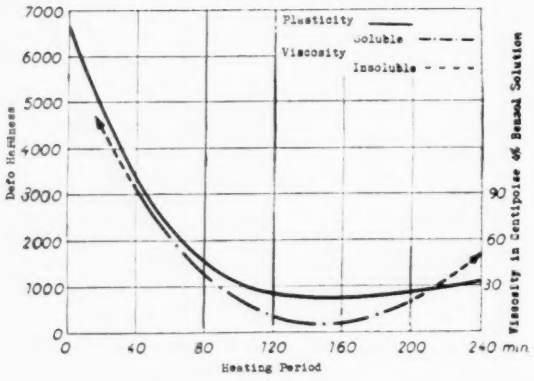


Fig. 1. Plasticity and Viscosity of 4% Benzol Solution Variation with Softening Time

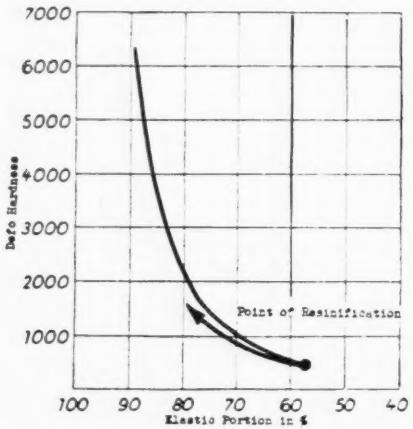


Fig. 2. A Typical Change of the Plastic-Elastic Conditions in Thermal Softening of Buna S

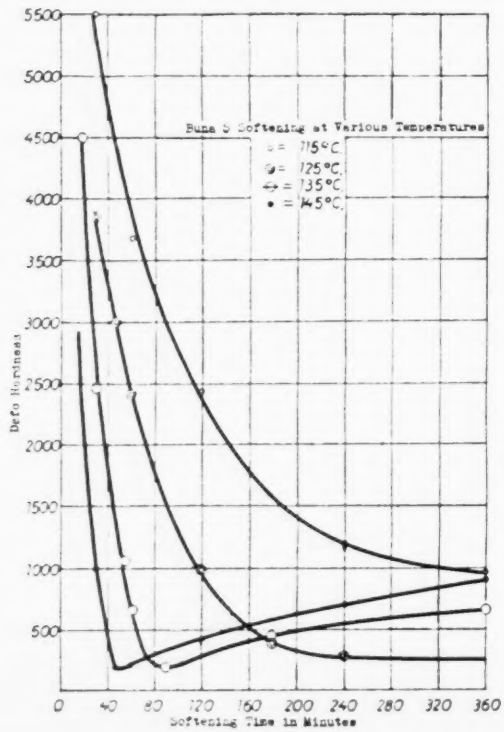


Fig. 3. Effect of Temperature on Softening Rate of Buna S

air pressure, and rate of revolution (turning over) of the pieces of rubber. With the aid of catalyzers that have not yet been put on the market, the rate of softening can be increased or the temperature reduced.

Relatively little is as yet known about the chemical process in (Buna) rubber during thermal softening. It is certain that it requires oxygen; no softening takes place in steam or nitrogen. At the same time a part of the phenyl-β-naphthylamine is sufficient to give the vulcanizate adequate protection against aging, and additional amounts of phenyl-β-naphthylamine should be added to the mix only when it is to be subjected to especially severe demands. Accompanying the softening process, a hardening of the buna takes place; if the buna is heated in the absence of air, it slowly becomes harder, that is, it cyclizes, forms nets or vulcanizes without the addition of sulphur. This secondary reaction therefore is opposed to the oxidative softening. Its rate increases with the temperature; hence the softening process should be carried out over short periods and at low temperatures.

Methods of Measuring

For the purposes of the present investigation three principles of determining plasticity were available. The determination of the viscosity of low-per cent. solutions ran against difficulties because only a small softening interval is sufficiently soluble. (Figure 1.) Measuring by the extrusion method after the Marzetti principle does not define the material exactly; the chief error lies in the sliding capacity against the walls of the nozzles and of the nozzle opening. This value is not constant for identical degrees of plasticity. Therefore compression between platens with parallel faces, and subsequent recovery were measured according to the Defo (deformation method) method developed by the Continental Caoutchouc G.m.b.H., which is the most satisfactory method and more completely discussed elsewhere.

Briefly, in this method cylindrical test pieces 10 millimeters high and 10 millimeters in diameter are compressed to four millimeters in 30 seconds at a measuring temperature of 80°. The force in grams, required to do this, is the Defo hardness and is a measure for plasticity, which drops when the Defo hardness increases. After a release period of 30 seconds the height of the recovery in 1/100 millimeter is measured and shown in percentage of the original height of 10 millimeters. For example: 1500—70 indicates: to compress the test piece to four millimeters in 30 seconds requires 1500 grams. In the next 30 seconds of release the test piece recovers by three millimeters to seven millimeters. Materials thus considered to be without elastic portion thus have an "elastic portion" of 40%, according to the definition.

This method of measuring has now come into practical use, and about four degrees of plasticity are used:

Non-softened Buna S, about ..... Defo 7000
Slightly softened Buna S for highly elastic qualities like carcasses ..... Defo 2000-3000
Medium soft, for abrasion-resistant qualities like treads, conveyer belts, etc. ..... Defo 600-1200
Very soft, for mechanical rubber goods, hard rubber, etc. Defo 300- 600

Plasticization of Buna by Thermal Softening

At present softening is carried out chiefly in double-jacketed vulcanizers, under pressure. The influence of the variables: time, temperature, pressure, and revolution of the material during softening will now be discussed.

When Buna S is treated by this method, the plasticity changes with the softening time as shown in Figure 1.

At first the Defo hardness drops very rapidly while

plasticity increases proportionately. At the same time the viscosity of a 4% benzol solution decreases. After a minimum is reached, the Defo-hardness and viscosity again increase. We shall call this minimum the resinification point because the products resulting with continued thermal treatment lose a very considerable part of their adhesiveness and, when the heating periods are long, produce hard, brittle, translucent substances which are no longer soluble in organic solvents.

Evidently, then, oxidative softening is succeeded by a resinification or cyclization reaction which becomes predominant beyond the resinification point. In this connection it is not certain whether the previously mentioned hardening reaction before the resinification point is dependent on the same process as it is after the resinification sets in.

The plasticity of raw rubber or of a compound is defined by the ratio of the plastic to the elastic portion. Therefore if the elastic portion is plotted instead of the softening time (Figure 2) the internal processes become clearer. Then the resinification point appears as an abrupt point (Figure 2). When heating is continued beyond the resinification point, it is mainly the elastic portion of the plasticity which increases, and the extrusion and calendering qualities of the rubber deteriorate markedly. In thermal softening care must be taken never to reach this point.

Figure 3 shows how temperature affects the rate of softening; the latter increases with the temperature; when the time is prolonged, plasticity differences are somewhat equalized; the danger of cyclization increases with the temperature; at lower temperatures the material shows greater uniformity, but elevated temperatures and short heating periods must always lead to a mixture of various degrees of softening. For the sake of quality the most uniform degree of softening possible is required. Therefore it is best, if possible, not to select softening periods under 30 minutes, for otherwise the steep part of the curve would have to be entered. For this reason and because of the danger of cyclization the lowest possible temperatures will in practice be selected, especially when larger amounts of buna have to be treated at one time. A longer softening period, moreover, gives better assurance of a constant temperature throughout the entire material.

On the other hand the softening temperature must not be too low; as the 115 degree curve in Figure 3 clearly shows, the optimum possible plasticity cannot be obtained at this temperature because even before the point of degradation, the cyclization reaction has already canceled a part of the possible plasticization again so that the resinification point is moved to low plasticities. Independently of the softening temperature, however, practically identical products are developed before the resinification point, which is easily recognized when the Defo hardness is plotted against the elastic portion, as in Figure 4.

All the measuring points lie on the same curve; that is, the same softening conditions are passed through. The danger of resinification at excessive temperatures once more becomes apparent.

If the requirement is admitted that the softening period should not exceed 30 minutes, then no further advantages can be obtained by an increase in temperature beyond a definite temperature. Figure 5 shows the results of softening at various temperatures. It is clear that the highest degree of softening is reached at 150 degrees, and further increases in temperature can only increase the danger of cyclization.

The effect of pressure and revolution of the material during softening at constant temperature in a small vessel is demonstrated by the curve in Figure 6. Lower Defo

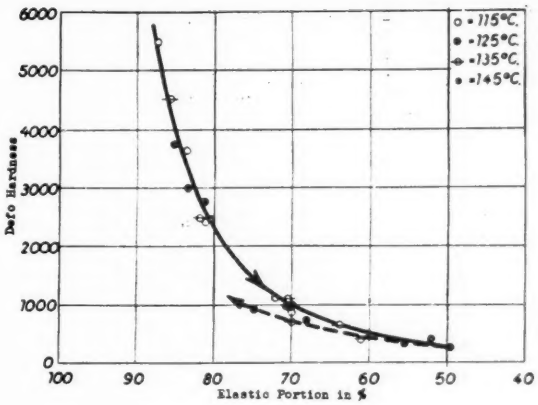


Fig. 4. Softening Conditions at Various Softening Temperatures

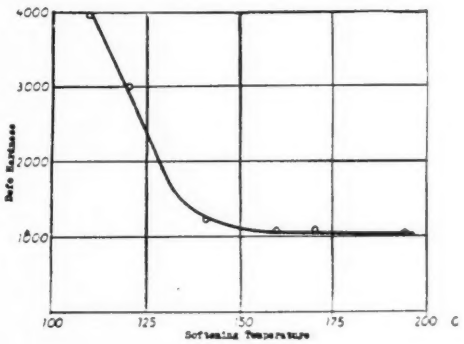


Fig. 5. Thermal Softening at Various Temperatures with a Heating Period of 30 Minutes

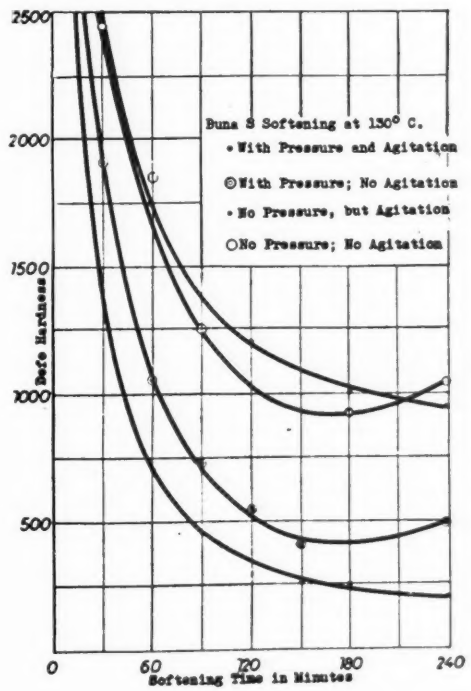


Fig. 6. Effect of Air Pressure and Turning Over of Material on Thermal Softening

numbers are obtainable with an air pressure of three atmospheres than without pressure. While the effect of revolution is less marked, still by omitting the process the danger of resinification is increased. Above 180 minutes both of the curves without revolution begin to mount again; that is, the resinification point has been exceeded. Therefore it should be attempted to make the fullest possible use of the favorable effect of air pressure and active revolution.

That no really different products are developed here either, is verified by the curve of Figure 7 in which the elastic portion is plotted against the plastic portion. Apart from the usual variations, all points are found to lie in one curve. Thus independent of air pressure and circulation, Buna S passes through the same plasticity conditions.

In addition to the vulcanizers with air pressure above atmospheric, ovens for treating buna have also been used and proved suitable in which buna, either in the form of crumb or sheet, is loaded on racks and passed through the apparatus on rails. Compressed air is dispensed with; instead heated air is circulated. Any differences in temperature due to the apparatus are completely compensated by moving the buna through all the zones of the apparatus. Both methods and both forms of buna (sheet or crumb) yield practically the same quality.

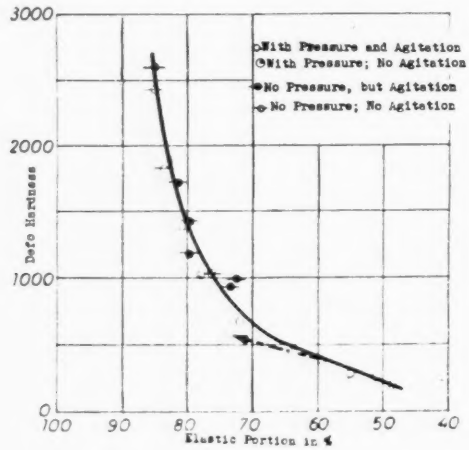


Fig. 7. Results with Various Softening Conditions

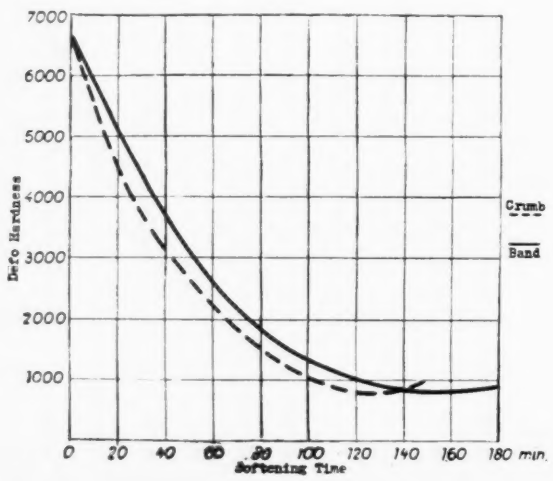


Fig. 8. Comparison of the Softening Rate of Buna S Band and Crumb

Here it is interesting to compare the softening of Buna S crumb, the form in which it has hitherto been delivered, with Buna S sheet, as it will be supplied in future. The form of buna depends on the method of precipitation and drying and has nothing to do with polymerization. The conversion from crumb to sheet brings with it a number of advantages. Because of the method of preparation, crumbs are not of uniform size, but consist of small and large flakes, which render homogeneous softening difficult since thorough oxidation of larger particles naturally takes longer than that of smaller ones. Furthermore crumbs stored for some time become caked and must be broken up again before the softening process. On the other hand the sheet, lightly dusted with talcum, can be easily unrolled again at any time and can be softened uniformly in layers of the same height. For uniform softening the crumb must be piled on racks to uniform height, but in the factory this piling is very difficult to achieve. Again, the sheet is porous and holds air; hence uniform softening throughout its entire thickness can be counted on. If the softening rate of sheet and crumb are compared (Figure 8), crumb is found to soften somewhat more rapidly, probably because of its large—but not defined—active surface. But uniformity in softening seems to be more important than speed so that for practical purposes sheet must get the preference.

If the plasticity of masticated Buna S is compared with that of thermally softened Buna S, it is found that the mastication periods and amounts of Buna treated are much less favorable, and the operation therefore more expensive, than is the case with thermal treatment, as Figure 9 shows. At the same time the amount of softened material depends on the size of the vessel. In the mastication test 1500 grams were masticated on the laboratory mill with rolls set together as closely as possible. If mastication were carried out on a factory scale on factory mills, the mastication curve would be still flatter. In any case it is interesting to note that very prolonged mastication results in somewhat different products than are obtained with thermal treatment. As Figure 10 shows, the elastic portions, and hence the extrusion and calendering qualities of the masticated material, are better than for material thermally softened to the same degree of plasticity.

It has not yet been found possible, either by means of additional ingredients or by changes in temperature and pressure, to move the softening curve of pure Buna S over substantially to the right, that is, to achieve low elastic portions with the same degree of plasticity. Therefore the procedure occasionally is to masticate first and to fol-

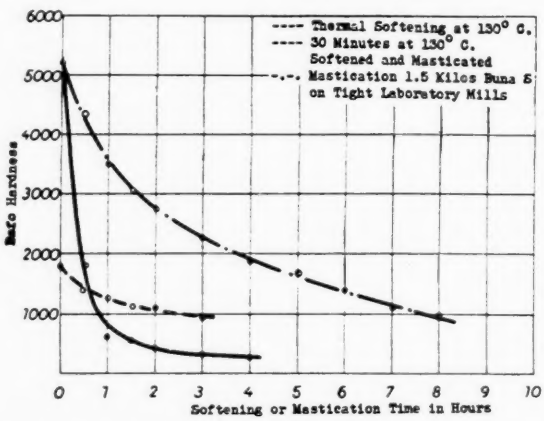


Fig. 9. Comparison of Mastication Periods with Softening Periods of Buna S

low this process up by thermal softening, when the relatively pronounced milling qualities of the untreated Buna S and the accompanying reduction in the elastic portion, which is also retained in the succeeding thermal treatment, are exploited.

When certain catalyzers are added in the proportion of about 1-2%, by rolling them on or by spraying on both sides of Buna S sheet, the softening rate can be substantially increased, as Figure 11 shows for two softening temperatures. As the original requirement of uniform softening of buna (Figure 3) would call for treatment in the steep zones in this case and hence softening periods of less than 30 minutes, which would be inadvisable, acceleration of time cannot in practice be achieved by means of the catalyzers, but a reduction in temperature can be obtained, which may be of importance for power consumption in the future when large amounts of Buna S are in use.

As far as present knowledge indicates, the products obtained differ in no respect from Buna S softened by thermal means only.

There are also catalyzers which permit softening even at room temperature, but the question of price and certain other considerations are against their use. It is to be hoped that future developments will lead to the discovery of catalyzers which are active at moderate temperatures and permit oxidative softening on hot rolls or in hot kneading machines so that mastication and mixing can be carried out as a single operation.

The storing qualities of thermally softened Buna in the European climate, and as measured by the plasticity, are adequate. As is the case with milled natural rubber, there is in the first few days a slight recovery which, with prolonged storage, tends asymtotically toward a final value. Simultaneously the solubility declines, and the viscosity of the solutions increases. At elevated storage temperatures, there is danger of a more marked internal cyclization, that is, hardening with measurable increase of the Defo hardness, especially of the elastic portion, and eventual complete insolubility. Thermally softened Buna S that has become insoluble in storage can generally be easily rendered soluble again by brief mastication.

Industrial Properties of Thermally Softened Buna S

The physical properties of the vulcanizates change as the degree of softening is raised; this is seen in its most exaggerated form on unfilled, transparent mixes. (Figure 12.) The decline in tensile strength, loading, elasticity, and hardness, as the degree of softening increases, is due to the decline in vulcanizability. As the permanent elongation indicates, the untreated Buna S is overheated, and the curves once more prove that the vulcanizing agents must be suited to the degree of softening.

In the present academic formula even careful adjustment of sulphur-accelerator will result in marked improvement of tensile and elasticity under certain conditions only. In the case of lightly filled mixes, of course, extreme softening can be dispensed with. On the other hand the effect of softening on the usual Buna-carbon-black mixes is not so marked. The same conditions will therefore be demonstrated on a tread. (See Figure 13.)

The composition of the mix has in this case also been kept constant. Here too we recognize the decreased vulcanizing facility (vulcanizability) by the rise in the permanent elongation and the decrease of the load. The drop in load is also due to the improved distribution of the carbon black, especially in the low plasticity zone (where little softening has taken place). The improved carbon dispersion is responsible for the increase in tensile at a low degree of softening; whereas the sharp drop in tensile with a high degree of softening is partly due to undercuring and can to some extent be corrected again by

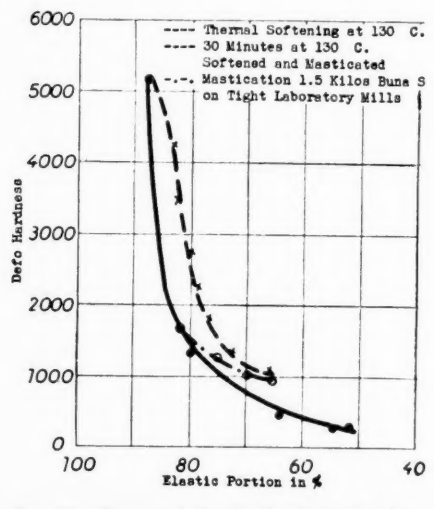


Fig. 10. Change of the Elastic-Plastic Conditions of Buna S during Softening or Mastication

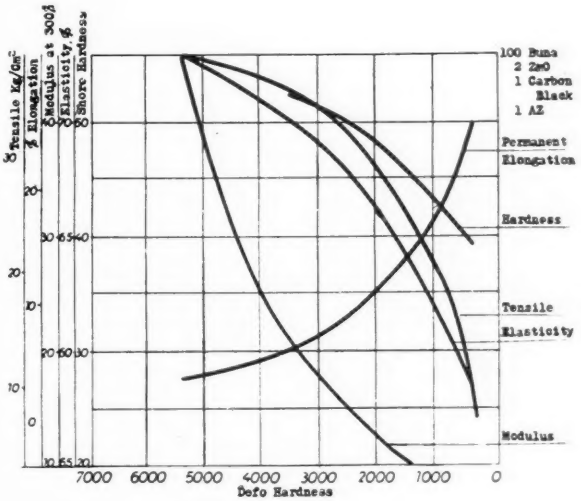


Fig. 12. Change in the Physical Values with Increased Softening: Transparent Quality

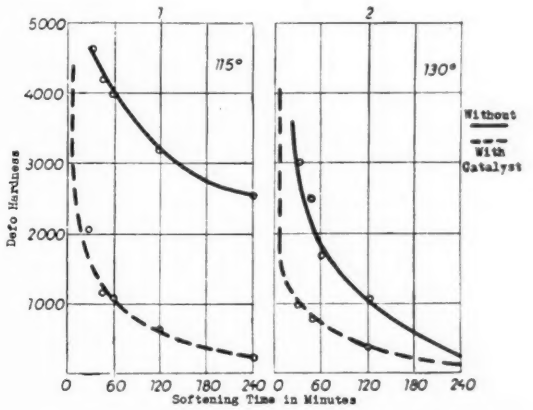


Fig. 11. Effect of Catalyzers on the Rate of Softening

higher doses of vulcanizing ingredients, and the same is true in order to correct the decrease in elasticity. Below a Defo hardness of 600, subsequent forcing up of values is usually no longer possible, just as in natural rubber that has been milled to death. However it is just possible to obtain tensiles of 150 kg./sq.cm. (2150 lbs./in.^{2}).

Figure 13 also makes it clear why highly elastic qualities with a low degree of softening are acceptable. It is not until Defo hardness falls below 2500-3000 that there is a noticeable loss in elasticity. In the case of tread compounds a slight decline can be tolerated, and consequently the softening process can be continued.

Thus when softened Buna S is used, the formula must be adapted to the degree of softening, especially the amount of sulphur and accelerator. No softener was added to the two unsoftened compounds as shown in Table 1. The changes in quality were still more marked in the case of a compound with high softener content. Thermal plasticization permits, or necessitates, as the case may be, a decrease in the amount of softener used, and so the formulas become increasingly more like those usual for natural rubber as the table for a conveyer belt compound shows.

TABLE I. CONVEYER BELT COMPOUND

	Buna S			Natural Rubber
	Not Softened		Softened	
Rubber	100.0		100.0	100.0
Carbon Black	42.0		42.0	42.0
Stearic Acid	2.0		2.0	2.0
Ozokerite	1.5		1.5	1.5
Sulphur	1.5		2.2	2.6
Vulkacit AZ	1.2		1.2	0.9
Cumar Resin	12.0		—	—
Colophony	5.0	32 pts.	—	—
Kautschol	5.0	Softener	—	—
Mineral Oil	5.0		—	—
Zinc Stearate	5.0		—	—
Test Results				
Tensile, kg./cm^2. (lbs. in^2.)	200 (2850)		250 (3560)	280 (3990)
Elongation, %	480		600	580
Elasticity, %	44		45	50
Shore Hardness	73		70	70

As in the present example, an improvement in quality can be achieved by softening, if the proper degree of softening is selected, while at the same time the time for mixing drops and larger volumes can be handled on the mill. In practice, however, it will not be possible to dispense with softeners altogether, even in the above compound, and even when the Buna S is considerably softened. For the higher elastic portion, as compared with natural rubber, still continues to be responsible for inadequate extrudability. To clarify this, a masticated natural rubber is compared with a thermally softened Buna S.

Figure 14 shows the difference in the plasticity conditions of softened Buna S and natural rubber at 20° and 80°, and with very low Defo values. With the same plasticity, rubber has a lower elastic portion and thus shows less tendency to shrink; that is, it is more easily and smoothly extruded and calendered. To obtain the same plasticity conditions as in natural rubber, the addition of substances to improve extrusion, as wool fat, wool wax, low polymer numbers buna, softener oil, etc., can hardly be avoided.

The undesirable loss in elasticity caused by thermal softening can in part be compensated by stiffer vulcanizates. This is all the more necessary since the elasticity of a compound that has not been thoroughly vulcanized changes unfavorably with the temperature. Thus the decline in elasticity in Figure 13 would be still more abrupt if the elasticity had been measured at the high temperatures found in tires.

Figure 15 shows that in the case of untreated Buna S, the rebound elasticity, as measured with the Schob pendulum hammer, rises slightly with the temperature. On

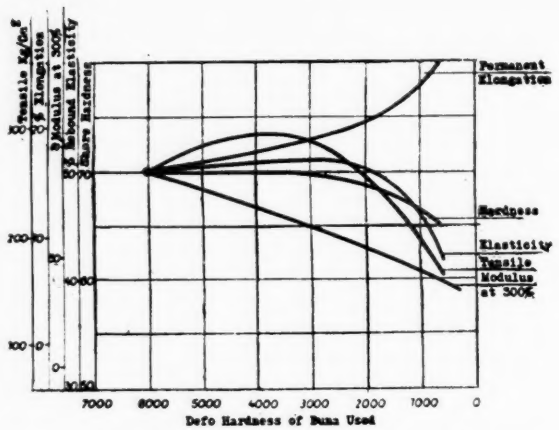


Fig. 13. Change in the Physical Values with Increased Softening: Tread Quality

the other hand the elasticity of very soft Buna S drops with the temperature when there is undercuring. The elasticity does not remain constant with increasing temperature until cure is complete. In the example in Figure 15 varying degrees of vulcanization are produced by means of the sulphur dose; because of the other properties of vulcanizates as aging, fatigue, etc., this is not permissible in practice to the same degree, but the dependence of the working capacity on the degree of vulcanization is more convincingly proved than if changes in accelerator had been carried out. The composition of the compound, especially the amount of accelerator, has thus been kept constant, except for the sulphur content. The curves show particularly clearly that the elasticity measurement at 20° does not adequately reflect the actual changes in quality that are present. Thus in order to determine working capacity, measurements should take place at about 70°.

Furthermore it becomes clear that an adequate degree of vulcanization is necessary, especially to improve the working capacity (strength). Hence accelerator doses must be selected which are sufficiently reliable in the early stages of vulcanization, but at the same time insure as thorough and rapid a cure as possible. In a large number of tests the accelerator, Vulkacit AZ, has consistently proved to be the most suitable for this purpose. At the same time the amount of sulphur is increased as com-

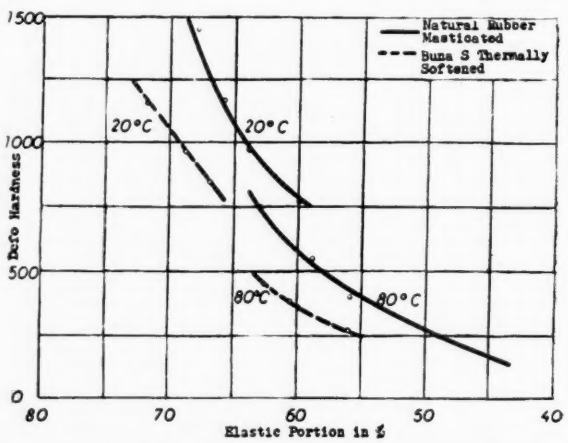


Fig. 14. Comparison of the Plastic-Elastic Condition of Oxidation Softened Buna S and Masticated Natural Rubber at 20° and 80° C

pared with non-softened Buna S, but this increase must be made with care because of the aging properties, especially resistance to aging in heat, which will be illustrated on a tread compound.

Industrial tread compounds of non-treated, and of very soft thermally treated Buna S, practically free from softeners, were aged. The formulae only differed with regard to the sulphur content, which was 1% for the non-softened and 1.5%[2] for softened Buna (Table 2).

TABLE 2. BUNA S AGING

Aging Days	Not Softened 1% Sulphur				Very Soft 2% Sulphur			
	F	D	B	E H	F	D	B	E H
0	225(3200)	690	38(540)	54 65	203(2900)	670	52	50 68
Geer 70° C.								
8	230(3280)	540	74(1055)	56 72	210(3000)	475	106(1515)	54 77
16	236(3380)	525	86(1225)	57 75	204(2900)	420	121(1725)	53 78
32	228(3250)	510	99(1410)	56 76	180(2560)	300	141(2010)	54 79
Bierer-Davis Bomb 60° C.								
8	227(3240)	675	54(770)	54 72	198(2820)	570	81(1155)	52 73
16	225(3210)	640	61(870)	55 75	196(2795)	540	90(1280)	51 76
32	211(3010)	640	67(955)	56 76	180(2560)	500	105(1495)	53 78

F = Tensile, kgs./cm.², (lbs./in.²).
D = Elongation, %.
B = Modulus, kgs./cm.², (lbs./in.²).
E = Rebound elasticity, %.
H = Shore hardness.

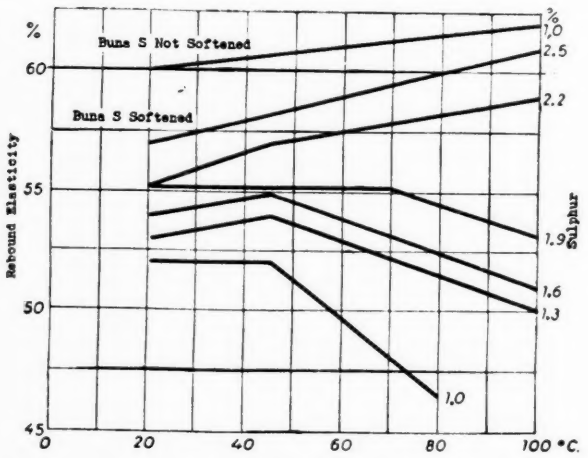


Fig. 15. Dependency of the Temperature Coefficient of Elasticity on the Degree of Vulcanization

In the case of the softened material the after-cure, that is, the increase in load and hardness, deteriorated especially at 70° Geer, for which the excessive increase in the amount of sulphur must be held chiefly responsible. For if a less steep increase in sulphur content is selected, and at the same time the accelerator content is increased, aging can be brought back to practically the original level, as Table 3 shows.

TABLE 3. BUNA S AGING

Aging Days	Very Soft Tensile, Kgs./Cm.² (Lbs./In.²)	1.2% Sulphur Elongation %	1.5% Vul. AZ Modulus, Kgs./Cm.² (Lbs./In.²)
0	230(3280)	720	30(427)
Geer 70° C.			
8	235(3350)	530	61(870)
16	238(3390)	510	80(1140)
32	240(3420)	500	91(1295)
Bierer-Davis Bomb 60° C.			
8	234(3330)	690	45(640)
16	228(3250)	630	57(815)
32	200(2845)	560	69(985)

Clearly then, the decrease in elasticity and vulcanizability, resulting from the softening process, should be compensated not only by increasing the sulphur content, but by changing the content or type of accelerator at the same time. Under these conditions the elasticity or working power of even very soft, thermally treated Buna S can be improved again although the level of non-treated Buna can hardly be reached.

Thermal oxidation softening plays approximately the same part in the processing of Buna S that mastication does with natural rubber. But we are still only at the beginning of a technical development so that the present contribution should be considered as a process that is still in the course of development, and it must finally be emphasized that while oxidative softening is a substantial advance in the problem of Buna processing, it has not yet been able to confer complete similarity to the behavior of natural rubber. The proper application of thermal softening demands a very high sense of responsibility in producers of rubber goods because in the effort to obtain good processibility too high a degree of softening can so easily be taken, and the resulting inferiority of the finished goods would shake confidence in German synthetic rubber. So that, in conclusion, it must once more be stressed that the softening degree must hurt the quality of the finished product as little as possible.

[2] Table 2 shows 2% sulphur for softened Buna. EDITOR.

Hycar Synthetic Rubber OR-25

A NEW grade of Hycar synthetic rubber, OR-25, which it is claimed retains the same ease of processing and compounding as Hycar OR-15, has just been announced. In addition Hycar OR-25 imparts to its vulcanizates the extremely valuable properties of low temperature flexibility at least 15° F. lower than is possible with equivalent Hycar OR-15 compounds and has a greater swell in gasoline and oil than OR-15, as required in many applications. The tensile strengths of OR-25 stocks are generally lower than OR-15 stocks by from 350 psi when soft blacks are used to 900 psi when channel blacks are used. Elongations are also lower, and a lower durometer hardness permits greater loadings to obtain the same hardness, it is reported. Specific gravity is 0.98; Lupke rebound is about 15 to 20% higher, and compression set is also somewhat better than similar Hycar OR-15 compounds. Air oven aging at 212° F. indicates that stocks from both grades have equally good heat resistance.

The new rubber has actually been in production for nine months, first in experimental quantities for one or two special applications and then on a large scale. It is now generally available since it has been proved not only by extensive laboratory tests, but by actual performance in the field in quantities large enough to be conclusive. It is claimed that with Hycar OR-25 certain specifications for swelling and low temperature flexibility that have hitherto been troublesome may now be found to be more easily met.

Data on blends of OR-25 with other synthetics are as yet rather limited, but it is known to have the same compatibility as OR-15, and blends of OR-25 with Hycar OS-10, polyvinyl chlorides, and similar synthetics should be extremely interesting and useful. It is stated that the Office of the Rubber Director has authorized the manufacturer to set aside a limited quantity of this new product, which may be sold in amounts up to 25 pounds for factory evaluation, without allocation. Hycar Chemical Co., Akron, O.

Ubatex—A New Polymerized Dispersion

Paul M. Fleuriel[1]

MORE than a year has elapsed since the rubber industry has been submitted to regulations which have increased in severity to the point where, before long, there will be little rubber available for many applications. The chemists throughout the industry, confronted with the general problem, met these various restrictions with products and methods to extend rubber. In the early stages of this work it was relatively easy, for in many cases rubber had been literally squandered because of its availability as well as its cost. With little modification of formulation or technique it was feasible to reduce the rubber content of a given compound perhaps by as much as 50%. But to any far-sighted group this period of relative facility was only an opportunity to probe for better and more lasting answers. The war effort was only beginning to drain civilian industrial requirements. The shortages due to diversion, to increased consumption, to lack of transportation, etc. were to come, and industry, in order to survive, had to meet the challenge, for by the end of 1941 it was obvious to all that the task would be both long and difficult.

It can be stated that the greatest general characteristic of rubber is its versatility for compounding, and it soon became obvious that it would be futile to attempt in an immediate program to develop an all around substitute. Therefore the many fields covered by rubber had to be classified and answered separately. We are now entering a period when the results of the past year's work in the laboratories of the industry are appearing in more or less refined stages of development. Most products have shown the versatility of the chemists as well as a high degree of achievement.

Although used in relatively small tonnage, latex was a very important form in which rubber was used. Each year new applications and new processes increased the consumption of rubber as latex and developments such as the foam rubber products were arrested by the war on the very threshold of unlimited expansion. The field of coatings and adhesives based on latex were tremendously affected by the shortage of this commodity, for only those connected with this specialized field realize how many operations were handled with latex and its many compounds.

In answer to this urgent need Ubatex is a milestone in the research which will lead to the ultimate manufacture of a true substitute for natural latex. Ubatex is a dispersed polymer at high concentration and low viscosity, so prepared that it gives a strong, flexible film. The comparison of Ubatex to latex is made only in order to make the transition from latex more readily understandable to those familiar with the latter. Ubatex is a new compound and resembles latex only in some of its characteristics.

The particle size is in the vicinity of four microns and is of the order of fineness of latex particles. As the pH of the dispersion is 9, it is easily coagulated or "set" by acid surfaces such as leather, thereby preventing undue penetration. However, like natural latex, reductions of concentration, aided by wetting-out agents similar to those used for latex, will give excellent impregnating compounds. The dry film is insoluble in water, but completely soluble in the aromatics and esters, while only partially soluble in ketones and petroleum. The film absorbs less moisture than rubber latex without losing appreciably in strength, is elastic, and on stretching will regain its former state. The great difference between rubber latex and Ubatex lies in the fact that although it is an alkaline dispersion, the compounding is different. Although the well-known proteins, starches, and gums can be added to modify viscosity, penetration, etc., the practice, as developed for latex, does not apply in the same way. Once this fact is understood clearly, the compounding of Ubatex becomes an interesting study, for no longer do prejudice and preconceived ideas prevent the attempt to use some of the chemicals which are still available.

It will be found that Ubatex can be modified to cover a wide scope of applications. However at the present stage of development it is not pressure sensitive. The film, at its maximum strength, is not tacky, and to date attempts to render it such with plasticizers only result in a loss of strength. For machine applications, when a fixed length of time elapses between the coating and the drying of the film, it is possible to bond the two surfaces together when in temper. The time may be extended if high boiling solvents are added, but caution must be used, for while in temper, the film has little strength as long as any solvent remains. Pressure sensitivity is not necessary for many operations, as Ubatex sets quickly, and wet bonds are almost immediate. If additional pressure is given, very rapid bonds of good initial strength are obtained. This is particularly true when rolls of cloth or paper are laminated on a machine and pressure is maintained during drying. The above is a typical method of application of Ubatex as an adhesive, but films of Ubatex, when applied to packaging materials, are proving of interest. Ubatex compounds can be made suitable for coating, and because the degree of thermoplasticity can be regulated, heat-sealing wrappers are feasible.

As industrial chemists study Ubatex for specific problems, many uses which to date have not even been thought of will be developed, for this basic product is a versatile tool which should be adapted to many industries.

[1] Chief Chemist, Union Bay State Co., Cambridge, Mass.

Reagent for Water Softeners

Recently announced as a new reagent for use with hot-process water softeners was phosphoric acid. Its use has been recommended as the reagent in single- or two-stage water softeners, taking the place of mono-, di-, and trisodium phosphate, to result in a better control of the alkalinity at reduced cost for the reagent.

With this method of operation, feed water has been treated and is reported suitable for 1,400-pound boilers, cutting the hardness to approximately ½ ppm.

Phosphoric acid, moreover, is said to produce a water of a hardness so low that all accumulation of sludge in boilers is avoided. The use of this reagent is also claimed to be satisfactory for the most critical condition of operation, and it has been tested in boilers operating at 1,400 pounds per square inch.

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EDITORIALS

More Than One GR-S Necessary?

IT WAS not possible to dispute the wisdom of the decision made by the Baruch Committee last September in recommending that no further changes be made in the plans for the construction of synthetic rubber plants, which in effect required standardization of the polymerization process and formula. However there is now a growing indication that consideration should be given to modification of the present standard formula and process for at least a portion of the total GR-S production. The Baruch Committee realized the danger of this standardization policy and also recommended that at least one standard copolymerization plant be completed as soon as possible in order that experience in operation and more complete evaluation of the properties of the finished product could be had while there was still time to make changes in the rest of the program. One or more of these plants should soon be in operation.

With the production of an appreciable tonnage from these plants, fairly conclusive information on degree of uniformity and properties of this polymer should be available in the not-too-far-distant future. If better uniformity from batch to batch is not realized, and slow curing rate, lack of tack, inadequate low temperature flexibility, more difficult processing, and other disadvantages of this polymer, as compared with natural rubber, continue as before, changes in the formula and process should be considered. New developments which have undoubtedly resulted from work under the direction of Assistant Deputy Rubber Director R. P. Dinsmore, in charge of Research and Development of Synthetics, should be tried out on a full-scale production basis.

The rubber industry in cooperation with the Office of Assistant Deputy Rubber Director E. B. Babcock, on Technology and Specifications for Industry Uses, has been trying to find the best methods for processing the present GR-S, and considerable progress has been made. Some of the difficulties appear at present to be incapable of early solution. Without subscribing to a policy which would add to the already heavy burden of those who must produce enough GR-S to supply the needs of the industry and the war effort during this critical year, if it is possible to provide some relief to the processors of this synthetic rubber by modification of the standard formula and process without too greatly reducing the amount produced, such modification should be tried on a large enough scale to provide a definite answer to this problem. The rubber industry was not forced or able to operate on one grade of natural rubber in the past, and it seems illogical that even in wartime rigid adherence to the policy of producing only one major grade of synthetic rubber should continue. Why not give the rubber processor some help in his conversion problem by slightly changing the polymer?

Eternal Vigilance Required

AFTER a very considerable effort during the last of 1942 and the first part of 1943, Rubber Director Jeffers succeeded in obtaining about February 1 "urgency ratings" for priorities for materials to construct synthetic rubber plants during 1943 which would have a production capacity estimated to be equal to 43.6% of the Baruch Committee's recommended program. Early in March he expressed some optimism at the rate that this plant construction was going with the help of the new ratings and mentioned that the output of some of the first plants to get into producion appeared to be considerably higher than was expected.

During the latter part of March, it is understood, the Armed Forces took the attitude that since the rubber program was going better than expected, the February 1 decision should be reviewed and the facilities for plants still to be constructed would not be needed now and could be used to meet demands for other war production. Nothing further has been learned regarding this move, but with the limited factor of safety as regards rubber that will be available on January 1, 1944, and if higher output of the first plants is counterbalanced by a lower output from some of the plants still to be constructed, a vigorous counter-attack against this move should be launched by the Rubber Director and the industry.

No one wants to see the armed services have the most and the best of everything that they require more than the rubber industry, which has an excellent record for converting idle or unused facilities to the manufacture of entirely new products, as guns and munitions, for high employe morale, and other contributions to the war effort. A consideration of the law of averages should bring the realization that encouraging progress with a small fraction of the total program certainly does not warrant taking a long chance that the remainder of the program will be equally encouraging. In fact parts of the program are still well behind schedule; many technical difficulties with the use of synthetic rubber remain to be solved; and a discouragingly small amount of new natural rubber is being brought into the country; all of which go a long way toward neutralizing any gains that may have been made in other parts of the program.

It is probable that the Rubber Director will be issuing another one of his periodic progress reports within another month or two, and in spite of his expressed desire in his second progress report to be able to make a more encouraging later report, it might be well for him to place more than the usual amount of emphasis on the fact that results, not estimates are the things that count. Until we have the necessary amount of rubber actually being produced and successfully used to maintain our war effort, no further curtailment of synthetic rubber plant construction should be even considered. The United Nations war effort has been more successful recently, but it is difficult to see how additional reductions in the synthetic program in the hope of a quicker defeat of the Axis would be a worthwhile bet.

What the Rubber Chemists Are Doing

Chemistry and War Production Theme of Spring A. C. S. Meeting; Rubber Division Papers to Include Goodyear Lecture

THE spring meeting of the American Chemical Society to be held at the Book-Cadillac Hotel in Detroit, Mich., April 12 to 16 will be a "War Meeting." It was called for the purpose of discussing the advancement of chemistry and means by which new information could be used to aid the war effort. More than the usual emphasis will be placed on technical sessions and opportunities for conference and group discussions. No plant trips or general entertainment is planned. The subscription dinner of the Society will be held on Wednesday night, and the banquet of the Rubber Division on Thursday night, however, both in the main ballroom of the Book-Cadillac Hotel. The speaker or speakers for the Rubber Division banquet have not yet been announced.

The headquarters of the Rubber Division will be in the Book-Cadillac Hotel, and following the precedent set at the September, 1940, meeting in Detroit, technical sessions will be held in the Masonic Temple. About 20 papers will be presented April 15 and 16, the majority of which will be on the subject of synthetic rubber; some of these have to do with the polymerization processes which are of new or increased interest to rubber chemists. The first paper on the afternoon of April 15 will be the second Charles Goodyear Lecture, by L. B. Sebrell, of the Goodyear Tire & Rubber Co., which is expected to be on synthetic rubber. The business meeting will follow this paper, after which W. L. Semon, of The B. F. Goodrich Co., will describe 30 years of research and development on synthetic rubber by this company. A report will be made by George A. Sackett, chairman of the Crude Rubber Committee, on April 16, and there will also be papers on carbon black and treated fatty oils for rubber. Available abstracts of the papers and titles for which abstracts were not available follow:

Molecular Weights of High Polymers. The theoretical basis for the determination of average molecular weights by viscosity, osmotic pressure, cryoscopic, and other methods is reviewed. Certain common procedures are shown to be unjustifiable and to lead to erroneous "molecular weight" values. It is proposed that the following be determined, for each type of polymer of interest: (1) the value of μ_1 (determining the concentration dependence of the osmotic pressure) for solutions of the polymer in a suitable solvent; (2) the value of k' (determining the concentration dependence of the viscosity) for solutions of the polymer in a suitable solvent; and (3) the empirical curve giving the dependence of the "intrinsic viscosity" (in the same solvent) on the molecular weight—using, for this determination, polymer fractions as nearly homogenous, as regards molecular weight, as possible. With this information available, a single osmotic pressure determination and a single viscosity determination suffice to determine "number average" and "viscosity average" molecular weights of a given sample. These two together give a much better characterization of the molecular weight distribution in the polymer than either one alone. Maurice L. Huggins, Kodak Research Laboratories, Rochester, N. Y.

Heat Generation in Rubber Due to Flexing. A flexometer is described which is adapted for the accurate and rapid determination of the temperature rise in a rubber test piece due to flexing in compression. The vibratory driving force is secured by passing 60-cycle alternating current through a coil in a strong magnetic field. The test piece is run at this frequency with a set amplitude for ten minutes. The temperature in the middle of the piece is then measured with a needle thermocouple and potentiometer.

Curves are given illustrating the effect of amplitude, cure, pigment loading and other factors on the temperature rise for natural rubber and for butadiene-styrene copolymer. The principles involved in heat generation by flexed rubber, as revealed by these experimental data and other vibration tests, are discussed with a view to understanding the fundamental molecular or structural mechanisms involved. Comparison is made of the phenomena observed with rubber in this respect and theories of internal friction which have been found to apply in other cases. In its temperature dependence, internal friction in rubber acts like a liquid viscosity; in its frequency dependence, it acts like solid friction. The type of structure which may be responsible for these effects is discussed. S. D. Gehman, P. J. Jones, and D. E. Woodford, Goodyear Tire & Rubber Co., Akron.

Flex Life and Crystallization of Synthetic Rubber. When natural rubber is stretched, crystallization takes place in a degree depending among other things upon the amount of stretch. This is revealed by X-ray data and by thermal effects. A more important consequence of this is that the rubber becomes fibrous. It is strengthened in the direction of stretching and weakened in the other direction. This can be demonstrated by stretching and then tearing across the grain and with the grain. It may be stated that rubber is reenforced by its own crystallization. A further proof is the fact that the flex life of rubber is extremely great when elongations are such that the test piece remains in the range of partial crystallization.

These effects are entirely lacking with GR-S (Buna S), but present in GR-I (Butyl). It is felt that their absence explains to a large extent the low tensile of GR-S in non-black compounds, its poor flex life, and its susceptibility to tear and cut growth. Data are presented particularly on tearing and flexing experiments. The tremendous flex life of natural rubber and GR-I while in a crystallized condition, will be demonstrated, as compared with the lack of such behavior in GR-S. J. H. Fielding, Goodyear.

Properties of Blends of "Thiokol" Synthetic Rubber Type FA with Neoprene GN, Hycar OR, and Perbunan. "Thiokol" Type FA is compatible with Neoprene GN, Hycar OR, and Perbunan. The properties of the blends vary with the ratio of the synthetics in the compound, but not always as a direct proportion. "Thiokol" Type FA swells less in aromatic blended fuels than the other synthetics, and the diffusion of such fuels through FA is also less. The swell and diffusion characteristics of the blends are intermediate between that of the synthetics blended. However this is not a straight-line relation. The same characteristics hold for other solvents. Other properties, as tensile strength, elongation, tear resistance, resilience, and compression set, show the same general trend. The blends studied were made from a standard "Thiokol" Type FA mix and similar compounds of the other synthetics containing no extractable plasticizer. The ratio of synthetic rubbers studied were 100/0, 90/10, 80/20, 60/40, 40/60, 20/80, 10/90, and 0/100. By plotting one property against variation in composition, trends are shown graphically. These data should serve as an indication of results to be expected from such compositions. S. M. Martin, Jr., and A. E. Laurence, Thiokol Corp., Trenton, N. J.

Agripol, a New Chemurgic Rubber Substitute. A brief background of the development of a rubber substitute, known as Norepol, by the Northern Regional Laboratory at Peoria, Ill., will be given. Norepol, an abbreviation from the names Northern Regional Polymer, is defined as follows by the WPB:

"A product capable of replacing rubber or reclaim for essential war or civilian use as approved by the War Production Board, comprising the reaction product of polyhydric alcohols with polymerized vegetable oil acids, or their derivatives, from which the monomeric acids have been substantially removed."

Agripol, derived from the words Agricultural Polymer, is the RCI trade name for a product covered by the foregoing definition of Norepol.

The Northern Regional Laboratory admitted that the research work on the Norepol was nowhere nearly completed at the time of its first announcement. Owing to the stress of war and the urgent need of rubber or a suitable substitute, it was felt, however, by the Laboratory that the cooperative efforts of a number of industrial laboratories and plants would be a much

better procedure than trying to complete the research at Peoria.

Characteristics of Agripol, as compared to rubber, are enumerated. Charts illustrating some typical compounding of Agripol and the physical data obtained by this compounding are given. A list of uses where Agripol is able to replace rubber as a satisfactory substitute is also given. Industrial products made from Agripol will be shown. Andrew J. Snyder and Clinton A. Braidwood, Reichhold Chemicals, Inc., Detroit, Mich.

Charles Goodyear Lecture. L. B. Sebrell, Goodyear.

Thirty Years of Contributions to the Science of Synthetic Rubber. This is the story of more than 30 years of research and development on synthetic rubber in the laboratories of one of the large rubber companies. The paper tells of early work on the process for making butadiene from alcohol through the aldol process. This butadiene was then converted to rubber by treatment with sodium. Commercial development of synthetic rubber had to wait upon progress in the related fields of antioxidants, accelerators, and carbon black.

Certain incidental and related outgrowths, as rubber isomers and Koroseal, preceded the actual solution of the synthetic rubber problem. Finally satisfactory synthetic rubbers were developed and manufactured, as evidenced by the Ameripol tires and the commercial Hycar rubbers now being sold. The outstanding progress already made in the development of synthetic rubber leads to some interesting predictions as to its future. W. L. Semon, B. F. Goodrich Co., Akron, O.

A Laboratory Technique for Experimental Polymerization of Synthetic Rubber. A ten-gram polymerization technique has been developed at The B. F. Goodrich Research Laboratories. With this technique can be obtained not only the yield, but also a polymerization curve showing the length of induction period, the rate of polymerization at any given time, and the yield of partially polymerized product at any desired time. The type of latex produced and the extent of precipitation at any time during polymerization are quite easy to observe. The pH of the latex can be measured at the end of the process. Sufficient polymer is obtained for physical tests by the Garvey procedure. This technique is particularly valuable for preliminary surveys which need to be made in the shortest possible time and is also useful for raw material control. C. F. Fryling, Goodrich.

Conductivity of Rubber and Synthetic Rubber Tread Stocks. Appreciable amounts of semi-conducting rubber will be required for war applications where it is desirable to dissipate static electricity, such as in the case of shoe soles and flooring in explosive plants, landing gear on planes, etc. Because of the shortage of acetylene black, it will be necessary to use more than ten million pounds of other types of carbon black for this purpose. In other cases it is desirable to have a low conductivity or high resistance stock. In this paper a general study of conductivity of typical tread-type stocks of rubber and synthetic rubber has been made.

The conductivity of tread stocks of natural rubber, reclaim, Buna S, Neoprene GN, "Thiokol" N, and Butyl 1.5 has been studied. Conductivity depends primarily on the carbon black used in the tread stock. Channel blacks ranging from the extra-soft type (particle diameter about 35mμ) to harsh type (particle diameter about 20mμ), special high conductivity channel blacks in the range of 10 to 15 mμ in diameter, and acetylene black were used. For all the rubbers resistance decreases sharply as the particle size of the channel black decreases.

Effect of aging and of swelling in naphtha on conductivity has been determined. In general, aging in an air bomb appears to increase resistance; however the increase is not large. Absorption of naphtha greatly increased the resistance of all stocks. The increase for the channel blacks was, however, less than for acetylene black. After naphtha immersion conductivity of special channel blacks was markedly better than for acetylene black. In some cases the high conductivity of acetylene black in rubber can be approached by special channel blacks. Results are also reported on an experimental channel black which, when properly compounded, is essentially equal in conductivity to acetylene black, far superior in tensile strength, but lower in plasticity and resilience. Leonard H. Cohan and Martin Steinberg, Continental Carbon Co., New York, N. Y.

Heat Resistance of Neoprene Type GN Vulcanizates. In contrast to rubber, neoprene vulcanizates become harder when exposed to air for an extended time at high temperatures. This hardening can be minimized by fully curing all compounds and by properly selecting the basic components of the stocks. A neoprene vulcanizate that has not reached its maximum state of cure will rapidly harden during the initial hours of heat exposure because this period will be equivalent to an extension of the time of cure. When fully cured, the neoprene vulcanizate does not show this rapid increase in hardness; consequently the degree of stiffening during heat exposure will be considerably less. This point is illustrated by extending the cure of Neoprene Type GN heat-resisting stocks from the usual 30 minutes at 287° F. to approximately 30 minutes at 324° F., or by using a strong accelerator, such as Permalux. Fully cured neoprene vulcanizates will be harder than those cured in 30 minutes at 287° F.; therefore adjustments should be made in the quantities of fillers and softeners used so that original specifications can be met.

In compounding Neoprene Type GN stocks for heat resistance 2-5% of an antioxidant on the polymer must be included. A combination of Neozone A and MUF gives excellent results. The oxides included as curing agents must be selected and used according to their effects on the vulcanizate after heat exposure. In general the compounds should contain a minimum quantity of magnesia and a liberal quantity of litharge or zinc oxide. Combinations of the latter are frequently used. In practical applications FF wood rosin has been found to be beneficial. The general effect of heat exposure on the properties of neoprene vulcanizates is also discussed. Don B. Forman, E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

Effect of Time and Temperature of Cure on Properties of GS-S Tread Stocks. GR-S tread compounds containing one part, two and three parts per hundred parts of GR-S, of sulphur, each with low, normal, and high acceleration (Captax—D.P.G.) have been cured for different times at 260°, 280°, and 300° F. Eight of the more important properties have been measured at each cure. Rates of cure are compared with respect to the different properties, the temperature of cure, the amount of sulphur, and the amount of accelerator. B. S. Garvey, Jr., and A. E. Juve, Goodrich.

Simple Vulcanizates of Buna S and Sulphur. A series of vulcanizates composed only of Buna S and sulphur is described. These range from soft rubber types to hard products resembling ebonite. Analytical and physical data are presented for the members of this series. The acetone extract, when calculated in terms of original polymer "as compounded", decreases to about one half its original value over the range from 0-35% sulphur and approaches a limiting value at the higher sulphur contents. This limiting value is assumed to represent non-polymer material originally present. The remainder of the original extract is believed to consist of low molecular weight polymer fractions, which become progressively less soluble as the percentage of combined sulphur increases.

The stress-strain properties of these vulcanizates, when plotted vs. sulphur content, show little resemblance to those of the corresponding rubber products. The elongation decreases slowly from a moderate value in the soft products to a low value in the hard products. The tensile strength increases at the same time from very low values in the soft region to high values for the hard samples. The products of intermediate sulphur content are especially interesting, as they possess intermediate tensile strength and elongation. The corresponding rubber products are very weak and have low values of both tensile strength and elongation. La Verne E. Cheyney, Goodyear, and A. L. Robinson, Goodrich.

Carbon Black in Butyl Rubber. In the manufacture of most rubber articles pigments are employed, and of all the pigments the carbon blacks are the most important, being used in large volumes. The importance of the carbon blacks, especially the channel and furnace types, is the result of the enhancement of physical properties obtained by their use. This effect of carbon black on vulcanizates of either natural or synthetic rubber may be controlled by particle size, the chemical nature of the surface, or the "structure" of the black, either separately or in combination. Whereas in natural rubber compounds one of these may have been considered of primary importance, in the synthetic, one of the others may be more important. Since it is now necessary to replace natural rubber by synthetics, it is very desirable to know

how they respond to different types of carbon black. This paper presents data obtained on Butyl rubber by varying the type and concentration of the black. The relation of the results to particle size and chemical nature of the surface of the different blacks is discussed. L. B. Turner, J. P. Haworth, W. C. Smith, and R. L. Zapp, Esso Laboratories—Standard Oil Development Co., Elizabeth, N. J.

The Brittle Point and Shatter Point of Some Rubber-like Compositions. Upon cooling to low temperatures, many rubber-like compositions undergo changes in their physical properties. The shatter point occurs at a higher temperature than the bend brittle point. These points shift, although maintaining their relative positions, according to the synthetic, the type and quantity of plasticizer, and the time of freeze. Highly loaded stocks of high durometer hardness have a narrow temperature differential between the bend-brittle and the shatter point. When the sample is bent at a high rate, the bend-brittle point approaches the shatter point. Glenn E. King, Johnson Rubber Co., Middlefield, O.

Report of Crude Rubber Committee. George A. Sackett, Faultless Rubber Co., Ashland, O.

Evaluation of Butadiene in the Presence of Other Unsaturated and Saturated Gaseous Hydrocarbons. This paper describes a butadiene analytical method, which is a departure from the usual maleic anhydride absorption technique and which presents certain advantages in respect to convenience and accuracy. The gaseous mixture is tested for total unsaturates by hydrogenating the sample. On another portion of the same mixture the percentage absorbed by mercuric nitrate solution is ascertained. Regardless of the number of double bonds, the unsaturated gas is absorbed by mercuric nitrate as though it were an olefin. The difference between the percentage of unsaturates found by hydrogenation and that determined by mercuric nitrate absorption gives the percentage of unsaturates having more than one double bond. This method has been tried on known blends made of normal butane, butadiene, and isobutylene in varying proportions, and all results have been found satisfactory. The same samples were analyzed for butadiene by absorbing the material in maleic anhydride, and a comparison of these results with those obtained by the method described is presented. In all cases the results obtained by the method described were in close agreement with the known values of the synthetic blends. An evaluation of the olefins and paraffins in a particular sample may be made by this method without further analysis. The results obtained by maleic anhydride absorption of butadiene were more time consuming and, as a general rule, failed to check known values as closely as the method described. J. F. Cuneo and R. L. Switzer, Union Oil Co. of California, Wilmington, Calif.

The Density of Carbon Black by the Helium Displacement Method. Sufficient X-ray diffraction data are now available to permit a calculation of the limiting density of a few commercial carbon blacks. Values of from 2.18 to 2.20 are calculated, which are considerably higher than the published experimental values. Carbon black densities have generally been obtained by pycnometric methods, using various liquids as the immersion fluid. These values are open to criticism on the basis of incomplete wetting of the pigment by the liquid.

In the present study a pycnometric method using helium as the immersion fluid has been employed to determine the density of commercial carbon blacks. The values obtained after a few hours' immersion in helium are only slightly higher than values obtained with the water pycnometer. These values represent the density of the "working particle" of carbon black and should be employed in practical application. The helium value, however, drifts for a period of some days, tending toward the limiting X-ray diffraction value. The rate and amount of helium diffusion depend upon the pore size within the "working particle." The sizes of the parallel layer groups comprising the "working particle" are nearly the same in all channel blacks. For acetylene black, however, these groups are considerably larger, giving rise to larger pores, and this condition and a pronounced helium drift indicate a considerable internal porosity. The present work not only provides accurate density values, but also adds support to the structure of carbon black as suggested by X-ray diffraction methods. R. P. Rossman and W. R. Smith, Godfrey L. Cabot, Inc., Boston, Mass.

Unsaturation of Butadiene and Related Polymers as Determined by Iodine Chloride Addition. This paper describes procedures developed to determine the unsaturation of polybutadiene, butadiene-styrene, and butadiene-acrylic nitrile copolymers. These methods depend on the use of *p*-dichlorobenzene for solution of the polymers and iodine chloride in carbon tetrachloride as the addition reagent, following the general technique employed in the standard Kemp-Wijs method for determining unsaturation of natural rubber. Data are presented showing a lower unsaturation in these polymers than would result from 1,4 polymerization of the butadiene. A method is presented to determine the styrene and butadiene content of butadiene copolymers which is based on changes in the carbon-hydrogen ratio with varying proportions of coreacted monomers in the final product. The iodine value can also be employed to approximate the styrene content. It has been shown that the content of GR-S and natural rubber in mixed vulcanizates can be accurately determined by employing the new iodine chloride addition procedure together with the chromic acid oxidation method used to determine the natural rubber present. A. R. Kemp and H. Peters, Bell Telephone Laboratories, Murray Hill, N. J.

Variation of pH Attributable to Phase Distribution in Synthetic Rubber Emulsion Polymerization Systems. During the course of emulsion polymerizations employing fatty acid soaps as emulsifying agents, a decrease in pH is observed. It has been found that a portion of this decrease can be attributed to a redistribution of the emulsifying agent from the organic to the aqueous phase. When a monomer, or presumably any other organic liquid exhibiting aqueous solubility, is added to a soap solution, within a definite range of pH, the pH of the system decreases to a minimum; at which point a second phase separates, after which on further addition of the monomer the pH rises. The minimum point can be used to determine the solubility of the liquid in the particular soap solution employed. The solubility increases as the soap concentration is increased. A tentative explanation is advanced, accounting for the observations in terms of the influence of solubilization and phase distribution on the hydrolysis of the soap. C. F. Fryling and E. W. Harrington, Goodrich.

Effect of Petroleum Products on Neoprene Vulcanizates. IV. Effect of gasolines. This paper and the preceding papers of the series show that the aniline point may be used as a criterion of the swelling effect on neoprene vulcanizates of a wide range of petroleum products. With those products having an A.P.I. gravity greater than 40 (kerosenes and gasolines) the Diesel index is preferred as a more precise criterion than the aniline point. Donald F. Fraser, du Pont.

Polar Compound-Treated Fatty Oils for Rubber. It was found that fatty oils can be brought into various rubber-like stages, and that treating the fatty oils with polar compounds (for instance, electrolytes) at temperatures of about 250° to 320° C. and vulcanizing the so-obtained fatty oil products, materials can be obtained with greatly improved rubber-compounding properties.[1]

In a pure gum formula, polar compound-treated linseed oil preparations were tested, and compared with a comparative linseed oil preparation treated in the absence of polar compounds otherwise under equal reaction conditions. In one series 5% sodium bisulphite was used as a polar compound together with 2% of various organic auxiliary agents. In a second series, various inorganic salts were tested. In a third series, purely organic polar compounds have been investigated. Results show that in loadings of 50 parts of treated oil to 100 parts of rubber, comparatively high tensile strength may be obtained, and that fatty oils treated with polar compounds seem greatly superior as rubber extenders, compared with untreated fatty oil preparations known in the art. The following types of polar compounds seem most interesting: various alkali metal salts, cadmium sulphide, barium sulphide, ammonium iodide, and *m*-nitraniline hydrochloride, pinene hydrochloride, *m*-xylidine sulphonic acid, etc. Aging experiments were also carried out, showing that even in the absence of antioxidants, polar compound-treated linseed oil preparations show good aging qualities in rubber mixes. Laszlo Auer, Ridbo Laboratories, Paterson, N. J.

[1] *Trans. Inst. Rubber Ind.*, Apr., 1929.

Industry Symposium Features N. Y. Group Meeting

THE spring meeting of the New York Group, Division of Rubber Chemistry, A. C. S., March 19 at the Building Trade Employers Assn. Clubrooms, 2 Park Ave., New York, N. Y., was featured by a very timely and interesting symposium on the present situation in various divisions of the industry as discussed by well-known representatives of the different fields. After dinner, Paul S. White, director of public affairs and news broadcasts for the Columbia Broadcasting Co. and an outstanding commentator, talked on his experiences and those of other well-known commentators in reporting world events. Attendance at the meeting totaled more than 300 members and guests, with 260 present at the dinner.

The first speaker was J. E. Robinson, manager product development and control, Naugatuck Footwear Plant, United States Rubber Co., who stated that although "business as usual" in the footwear industry had been out for some time, he felt that this branch of the industry had maintained a good volume and had been doing a reasonably good job on military and essential civilian items. By virtue of work with the WPB during the last several months, formulas and methods for use of GR-S and GR-I have been worked out. All companies in this branch have had some factory experience with GR-S, it was stated. Typical upper and soling stock formulas using GR-S were given. Samples of past and present work rubbers and boots were exhibited, and Mr. Robinson concluded with the statement that the use of synthetic rubber in the footwear industry presented no major difficulties.

The next speaker, R. A. Schatzel, director of research, General Cable Corp., declared that by use of reclaim of good quality, neoprene, vinyl resins, Butyl, "Thiokol", etc., the wire and cable industry had made good progress in making satisfactory products with less and less natural rubber. Problems of preparing compounds to meet minimum requirements for various grades of stocks were mentioned. It was stated that a most important principle was to consider replacements for natural rubber in insulation in the light of their value as insulating materials rather than as replacements for rubber. Government specifications have had to be revised to be applicable when government synthetic rubber is used, and the WPB Technical Committee has aided greatly in this work and with the further advantageous result that specifications have been simplified. Improvements in certain properties of GR-S that would greatly help this branch of the industry such as better low temperature flexibility and greater uniformity of cure were mentioned. In any event the use of synthetic rubbers in the wire and cable industry was working out reasonably well, the speaker concluded.

Next was W. J. O'Brien, Jr., chief chemist, Seamless Rubber Co., who began by pointing out the finished product requirements peculiar to the sundries industry, such as, feel and hand, appearance, color, shape, odor, and taste. Rate of deterioration is also a particularly important problem in this industry. Very little reclaim had been used in sundries up to a year ago, but development of the use of high-quality reclaims in the manufacture of these products had resulted in processing improvements and product qualities considerably in excess of what had been expected, it was stated. With extenders for natural or synthetic rubbers the requirements were particularly severe because of the color and odor problem. Improvements of fine particle size fillers other than carbon blacks for synthetic rubber was a major problem. Blends of GR-S and Hycar OS-10 were giving interesting results, it was said but the longer processing time of GR-S was also still a big problem in this industry.

R. R. Lewis, general superintendent, Vulcan Proofing Co., followed. Products of the proofed goods industry probably varied with the times more than any other branch of the industry, he said, giving examples of such changes that had taken place in the last decade. The present major products were barrage balloons, boats, and life vests. Many rubber substitutes and synthetic resins were being used and a recent development was spreader coating of reclaim compounds.

O. J. Lang, chief chemist, Armstrong Rubber Co., the fifth speaker, discussed the state of development of tires made from synthetic rubber. Tires have been made from Butyl, neoprene, and GR-S, but the major effort is now on GR-S. All companies are concentrating on producing the best possible tire with GR-S, and test fleets, both private and military, are in continuous operation. The WPB Educational Committee has been of great assistance in collecting and disseminating information on the latest developments in GR-S tire compounding and building. The Committee has called to Washington technical representatives from all the tire companies individually and has gone over the progress made and offered suggestions for speeding up the work. Tires of some sizes of almost 100% GR-S have been approved by the Ordnance Department, United States Army, and are now in production. Tires of larger sizes have not yet been approved. Changes in specifications for these tires have recently been made, and further testing is in progress. The problems of the tire compounder in deciding on what balance between embrittlement, tear resistance, heat build-up, etc. he could obtain by adjustments in compounding and processing were discussed. Tires satisfactory for most ordinary services from GR-S are being made, Mr. Lang stated in conclusion.

The last speaker of the symposium was Joseph Hayes, factory manager, Rodic Rubber Co., who discussed the present-day problems of the mechanical goods industry. Neoprene, Buna N, and vinyl resins have been used with varying degrees of success here. Work to date with GR-S has been limited, and considerable difficulty in compounding and processing experienced. Better plasticizers are desired and modifications of GR-S suggested to aid in its use by this branch of the industry were mentioned. The importance of cooperation between the various companies in working out problems of synthetic rubber usage was stressed.

After dinner Mr. White entertained with a talk on his experiences in organizing broadcasts on the coronation of King George VI in 1937 and President Roosevelt's trip to Brazil in 1936 and the experience of Collingswood, Dunn, Cecil Brown, and Larry Le Sueur in their coverage of events all over the world. He gave examples to illustrate danger in and inaccuracy of many strange and varied "rumors" that crop up from time to time, and in answering questions after his talk gave some extremely interesting information on the "news" behind the news.

John A. Britton, Jr., of the Standard Oil Development Co., 26 Broadway, New York, N. Y., is mourning the loss of an Esso service pin lost at the New York Group dinner. It is oval in shape with a blue enameled border and a white star in the center. Its return would be appreciated.

Crosby Addresses L. A. Group

THE March 2 dinner-meeting of the Los Angeles Group, Division of Rubber Chemistry, A. C. S., held at the Mayfair Hotel, was marked by a 45-minute discourse on "Applications and Development of 'Thiokol' Synthetic Rubbers" by J. W. Crosby, sales manager of Thiokol Corp. Using several slides and illustrations, Mr. Crosby emphasized the special advantages of the various types of the synthetic in different applications. He also answered many questions put to him by the audience, consisting of about 105 members and guests.

The other speaker was Boyd Comstock, athletic coach, author, and radio commentator, who revealed his experiences abroad particularly those while he was an athletic director in Italy.

At the business meeting the committee chairmen presented their reports. Membership is increasing, and the financial condition of the Group is good. Seven new members were initiated, a ceremony now forming part of the regular monthly meetings.

Prizes, as usual, were awarded. Western Shade Cloth Co., through Ed. Royal, donated $10, $5, and $3.75 in war stamps, won, respectively, by C. M. Reinke, Bob Short, and Herman Jordan. Mr. Crosby won a traveling case; while a poker set went to Jack Bain; both gifts were donated by F. H. Banbury. On behalf of H. Muehlstein & Co., Inc., B. E. Biheller presented two billfolds.

Synthetic Rubber Posers

APRIL 30 is the date of the spring meeting of the Chicago Group, Division of Rubber Chemistry, A. C. S., at the Morrison Hotel, when the topic of discussion will be synthetic rubbers. H. A. Winkelmann, following his paper on "A Comparison of the Synthetic Rubbers", will conduct an open forum with the assistance of a "board of experts" to answer any questions pertaining to synthetic rubber. Those planning to attend are urged to come well prepared with questions.

Butyl before Boston Group

A VERY comprehensive and interesting paper on the "Compounding and Vulcanization of Butyl Rubber" was the technical feature at the spring meeting and dinner of the Boston Group Division of Rubber Chemistry, A. C. S., held at the University Club, Boston, Mass., on March 12. More than 200 members and guests were present.

The paper on Butyl rubber was presented by Gavin A. Taylor, technical representative of Stanco Distributors, Inc., who substituted ably for the scheduled speaker, J. E. Lightbown, of the same company, who was unable to attend. Mr. Taylor answered many questions regarding compounding practice and results and then presented the motion picture "Dancing Molecules," illustrating the chemical development of Butyl.

Another feature of the meeting was an address by Bruce Thomas, prominent war correspondent, on "Second Front Commandos," who told, from personal experience, of the intensive training of the British Commandos, the careful preparations and rehearsals for their raids, and what they had accomplished. He drew a graphic picture of the general war situation on the European front and discussed it at some length.

Northern California Group

ON FEBRUARY 25, C. A. Carlton, manager of the development department of J. M. Huber, Inc., addressed the Northern California Rubber Group, Oakland, Calif., on "Some Practical Aspects of Buna S Compounding." After reviewing the properties of the polymer and its handling in laboratory and plant, Mr. Carlton outlined procedure for the construction of Buna S compounds, including sulphur-accelerator ratios, pigmentation, and discussed the relative merits of the various types of softeners. The solubility of sulphur in Buna S was discussed, and a procedure for obtaining complete distribution was recommended. (See pages 35-36, this issue.)

The other speaker of the evening was J. W. Crosby, sales manager of Thiokol Corp., who discussed the latest developments in "Thiokol."

Two door prizes were awarded: a technical book on rubber donated by H. M. Royal, Inc., who also furnished the table favors; and a lamp from Thiokol Corp.

At the March 25 meeting of the Group, held at the Claremont Hotel, Oakland, with 47 members and guests in attendance, Kenneth Marple, of Shell Development Co., talked on the "Chemistry of Synthetic Rubber" and illustrated his theme with slides. Then Frank Durbin, of Shell Chemical Co., showed the motion picture, "Nitration Process", revealing how soft carbon black is manufactured at the Shell nitration plant at Pittsburg, Calif.

The door prize, consisting of a $5 merchandise order contributed by L. H. Butcher Co., was drawn by John Perona, of Shell Development. Table favors were furnished by Shell Chemical Co.

Ninth Annual Chemurgic Conference Held at Chicago

MANY items of interest to the rubber industry were discussed in some of the papers presented before the Ninth Annual Chemurgic Conference at the Drake Hotel, Chicago, Ill., March 24 and 25, by representatives of the rubber and associated industries and the War Production Board.

A review of the development of Agripol and a description of some of its properties, uses, and present production rate were given by Andrew J. Snyder, of Reichhold Chemicals, Inc. He stated that although this material could not be classed as suitable for tires, its possibilities as a recapping material were being investigated. Good low temperature flexibility down to —40° F., good oxygen and ozone resistance, and outstanding dielectric strength and corona resistance were emphasized. Agripol can also be produced and used in the form of an emulsion, it was said. Tensiles varying from 250 to 1275 psi, elongations from 65 to 180%, and Shore hardness from 40 to 90 are physical properties of this chemurgic rubber. Present production rate is about two million pounds a month.

Kok-sagyz seeds flown to this country from Russia during the last year were planted and grown in one hundred different test locations in the United States, according to H. L. Trumbull, of The B. F. Goodrich Co., in reporting on domestic sources of rubber. Work on *cryptostegia* and guayule were mentioned. An active program of study to develop methods of recovering rubber from *kok-sagyz* roots and to determine the processing characteristics of the rubber itself is now under way. Small amounts of natural rubber are often necessary for compounding synthetic rubber, and the continuing study, being financed by Goodrich at Cornell University, would aid in the development of native natural rubber to fill this need and contribute to complete elimination of dependence on foreign sources.

The major synthetic rubbers now included in the government program and rubber-like plastics used extensively to replace rubber during the past year were reviewed by Otis D. Cole, of Firestone Tire & Rubber Co. A brief résumé of the government synthetic program was given. In commenting on the production of butadiene from alcohol by the Carbide & Carbon process, the use of 80,000,000 bushels of corn or its equivalent in agricultural products per year was indicated. The recent price reduction of synthetic rubbers, new advances in methods of production of synthetic rubber, and the fact that synthetic rubber can be "tailor-made" to suit special needs were cited in predicting an almost unlimited future for this material.

Technological progress being made today at a rate unattainable during peace is providing a tremendous stimulus that is bound to serve us for years to come, according to M. C. Teague, of United States Rubber Co. Certain sections of the rubber, the chemical, the petroleum, and the plastic industries are rapidly being amalgamated into a new, or at least a different industry, he said. It should be stressed that the work of the associated industries in their hunt for suitable synthetic rubber for tires may have developed many new rubber-like plastics now awaiting future recognition. Later they may be used as synthetic rubber or in the plastic field or as bases for textile fibers. Present rubber products will be redeveloped to produce improved aging, appearance, and service, Dr. Teague stated in commenting on the use of the various rubbers in footwear, mechanical goods, in automobiles, railroads, airplanes, insulation, and textiles. The speaker predicted that the rubber industry would enter the field of the construction of pre-fabricated houses, either to manufacture the houses or many new products designed especially for them.

Wartime consumption of 200,000,000 bushels of grains a year for the production of industrial alcohol cannot continue after the war demand ends, since this country may be called upon to help feed hundreds of millions of people throughout the earth in the post-war years, stated Charles L. Gabriel, of the Publicker Commercial Alcohol Co. Both synthetic rubber (GR-S) raw materials, butadiene and stryene, can and are being made from alcohol. He pointed out that the recent curtailment of the total butadiene program had not changed the amount to be produced by the Carbide & Carbon process and that the amount to be made by this process now represented 50 instead of 30% of the total. The fact that the single step, direct conversion Polish process now being piloted by Publicker, requires relatively small amounts of critical materials of construction, is simple in operation, and has been in operation in Europe on a 10,000-ton a year basis certainly warrants its large-scale use in this country, Mr. Gabriel declared. In the future butadiene from alcohol should certainly be competitive with butadiene from petroleum, and alcohol should play its part as a partial replacement for petroleum to make up for its diminishing availability and to help conserve one of our most important natural resources.

Alcohol from black-strap molasses was one of the cheapest and best methods, but because of the tanker shortage plants formerly using this material are now switching to corn or grain, reported D. B. Keyes, of the WPB. Since the Commodity Credit Corp. is now in a position where it is impossible to supply alcohol distilleries with sufficient corn, it is encouraging the use of whole wheat or granular wheat flour although the technical information, including the recovery of feed stock from the waste materials, is not complete. New emphasis is also being given to the production of alcohol from waste wood or sulphite liquor. Butadiene from butylene glycol by fermentation was considered an attractive process because of the relative simplicity from an engineering standpoint.

In speaking on recent advances in the production of alcohol, Earl D. Unger, of Joseph E. Seagram & Sons, Inc., mentioned the development of a continuous cooking and flash conversion process for the production of a fermentable mash from grains, a continuous aerobic yeast process, and a fast and continuous fermentation process,

all of which would result in increased production of alcohol and at the same time save considerable critical materials of construction. Advancements and new processes based on sound engineering and bacteriology are transforming an ancient art into modern science.

Reporting production of butadiene from butyl alcohol, ethyl alcohol, and 2,3 butylene glycol to be 2.1, 5.8, and 6.5 pounds respectively from one bushel of corn, Paul J. Kolachov, also of Seagram, cited these figures as the reason for this company's piloting of the 2,3 butylene glycol process. High purity of butadiene produced was reported as an additional advantage of this process. Encouraging results with experimental plantings of *kok-sagyz* seed obtained from Russia were also described. A study of the production of butylene glycol from the roots of this plant was indicated as desirable because of the value of this material as a by-product.

Ontario Section Election

THE final regular dinner meeting of the season of the Ontario Rubber Section, Canadian Chemical Association, was held at the University of Toronto, March 10, when the following officers were elected for the 1943-44 season: chairman, John Ramsay, Gutta Percha & Rubber, Ltd., Toronto, Ont., secretary-treasurer, Harold Deline, Dunlop Tire & Rubber Goods Co., Toronto; committee, R. M. Ferguson, Naugatuck Chemicals, Ltd., Elmira, Ont., J. W. Holmes, Polymer Corp., Toronto, and M. L. Johnston, Canadian General Rubber Co., Galt, Ont.

Speaker of the evening was W. D. Parrish, of Hycar Chemical Co., Akron, O., who discussed very thoroughly, with a wealth of interesting and informative detail, the compounding and characteristics of Hycar OS 10, Hycar OR 15, and Hycar OR 25. A large number of products made of these materials was also shown.

The Ontario Rubber Section plans, instead of the originally scheduled international session with the Buffalo Group, Division of Rubber Chemistry, A. C. S., in Niagara Falls, to hold a joint luncheon, April 16, with the Group at the A. C. S. meeting in Detroit, Mich.

New Ordnance Tentative Specification AXS-878

A NEW tentative specification AXS-878, to assist in the process of conversion of mechanical rubber items and parts from natural rubber and its derivatives to synthetics and substitutes, has been announced in a communication from R. D. Woolery, Rubber Consultant, Materials Section, Technical Division, Ordnance Department, U. S. Army, Washington, D. C. This specification is based on recommendations of the SAE-ASTM Technical Committee A on Automotive Rubber, and coordination of these data for Ordnance use was accomplished by cooperation of the Ordnance Department with technical experts of the automotive and rubber industries, it is stated. These SAE-ASTM proposed specifications were published in INDIA RUBBER WORLD, August, 1942, pages 467-469. Changes found in the new tentative Ordnance specification are as follows:

1. Under natural rubber (R) classification the use of the suffix letter "F" following the code number establishes the requirement that the material shall pass the cold test at minus 40° F. If the designation is "FF", the temperature requirement is lowered to —70° F.

2. In the synthetic rubber (S) classification, the use of the "B" suffix is limited to the B and C grades and to the numbers published in the new specification. The SA classification is not included in this test since the polysulphides are thermoplastic and take a high permanent set.

3. Additional classification numbers, changes in classification numbers, and other changes found by comparing the specifications found on page 468 of the August, 1942, INDIA RUBBER WORLD and the new specification AXS-878 are tabulated below.

It is also stated that it is the intention of the SAE-ASTM Committee and the Ordnance Engineers who collaborated in the preparation of this specification that it shall be broad in its application. Only tires, inner tubes, sponge rubber, and hard rubber have been excluded. Special conditions, such as contact with anti-freeze solutions, high abrasion resistance, flex cracking resistance, high temperature conditions, exposure to acids, special requirements pertaining to impermeability of gases, adhesion to metals, fire resistance or electrical insulation or conductivity, are not provided for in this specification and should be indicated on the drawing, purchase order, or contract.

The maximum effective use of this new specification involves:

A. A thorough analysis of the current model or part to establish its characteristics and functional conditions.

B. A choice of at least two compounds of different grade, if oil resistance is a requirement, employing numbers as closely in conformity to the current physical properties of the part as possible, specifying by suffix letter or otherwise all special requirements.

C. Make exhaustive tests to prove conclusively that the new materials will function perfectly.

D. Standardize the tested materials for procurement.

Copies of this specification may be obtained from the Office, Chief of Ordnance, War Department, Washington, D. C.

Rubber, Plastics Group, A.S.M.E.

THE Rubber and Plastics Group status of the former Rubber Section of the A.S.M.E.'s Process Industries Division has been officially approved by the American Society of Mechanical Engineers, and the Group has announced officers for 1943. A joint meeting with the SAE Aviation Division to be held in Los Angeles in June is being planned. The program for the annual meeting to be held probably in December is now being considered, and any suggestions will be welcomed by the secretary.

New officers for 1943 include: Gordon M. Kline, National Bureau of Standards, as chairman; E. F. Riesing, Firestone Tire & Rubber Co., vice chairman; and Robert A. Boyer, Ford Motor Co., secretary. The executive committee includes, besides the officers, L. E. Jermy, *Machine Design;* J. F. Downie Smith, United Shoe Machinery Corp.; E. G. Kimmich, Goodyear Tire & Rubber Co.; and F. L. Yerzley, Western Electric Co. The general committee follows: G. H. Kaemmerling, Lord Mfg. Co.; H. M. Richardson, General Electric Co.; D. H. Cornell and F. L. Haushalter, both of B. F. Goodrich Co.; A. L. Alves, Watertown Mfg. Co.; J. Delmonte, Plas-

(*Continued on page 70*)

Classification Number	A.S.T.M. Hardness	Shore Hardness	Minimum Tensile Strength, psi	Minimum Elongation	Maximum Compression Set 158° F.	Maximum Compression Set 212° F.	Oven Aged: Tensile % Change	Oven Aged: Elong. % Change	Oven Aged: Durometer (Points Change Limits)	Oil Aged: Volume (% Change Limits)	Oil Aged: Tensile (% Change)	Oil Aged: Durometer (Points Change Limits)
SB-400B	105±15	40	....	....	..	70	....	....	0 to 15	−15 to 25	....	−10 to 15
SB-500B	75±10	50	....	....	..	65	....	....	0 to 10	−5 to 25	....	−10 to 10
SB-600B	55± 8	60	....	....	..	65	....	....	0 to 10	−5 to 25	....	−10 to 10
SB-700B	40± 7	70	....	....	..	65	....	....	0 to 10	−5 to 25	....	−10 to 10
SB-715	40± 7	70	1500	300	30	..	−20	−60	0 to 10	−5 to 25	−20	−10 to 10
SB-725	40± 7	70	2500	300	30	..	−20	−60	0 to 10	−5 to 25	−20	−10 to 10
SB-800B	28± 7	80	....	....	..	65	....	....	0 to 10	−5 to 25	....	−10 to 5
SB-815	28± 7	80	1500	150	30	..	−20	−60	0 to 10	−5 to 25	−20	−10 to 10
SC-315	150±20	30	1500	500	70	..	−15	−40	15	150*	−75	−30 to −10
SC-400B	105±15	40	....	....	..	70	....	....	15	140	....	−35 to −15
SC-420	105±15	40	2000	500	65	..	−15	−40	15	140	−70	−35 to −15
SC-500B	75±10	50	....	....	..	65	....	....	15	130	....	−40 to −20
SC-507	75±10	50	700	300	60	..	−15	−40	15	130	−60	−40 to −20
SC-525	75±10	50	2500	400	60	..	−15	−40	10	120	....	−50 to −20
SC-600	55± 8	60	....	....	..	65	....	....	10	120	−50	−50 to −20
SC-625	55± 8	60	2500	300	55	..	−15	−40	10	110	....	−50 to −25
SC-700	40± 7	70	....	....	..	65	....	....	10	100	....	−50 to −30
SC-800	28± 7	80	....	....	..	65	....	....				

* All old and new SC classifications have only one value for volume change limits instead of a range as in original proposed specifications.

UNITED STATES

More Emphasis on Value of Natural Rubber; Rubber Prices Changed

The formation of the Rubber Development Corp. as a direct subsidiary of the RFC and separate from the Rubber Reserve Co., as announced late in February, has indicated that new and increased emphasis will be placed on the procurement of natural rubber, particularly during 1943. The growing realization that we must have some natural rubber to blend with synthetic rubber for some of our most important military and essential civilian uses and the fact that without increased imports of natural rubber our stockpile will be at a very low point by the end of this year have undoubtedly contributed to this new activity. The Rubber Development Corp. will have on its staff many members of the former Wild Rubber Division of Rubber Reserve and is headed by Douglas H. Allen, who will soon leave for Brazil to determine ways and means of getting the most natural rubber out of South America this year. It is understood that the appointment of Herman B. Baruch, of New York, brother of Bernard M. Baruch, as head of the BEW office in Brazil, will not interfere with the work of the Rubber Development Corp. since the BEW will devote most of its efforts to procuring all the other desired raw materials and leave rubber in the hands of the new organization. If any new reduction in the amount of synthetic rubber to be produced in 1943 becomes apparent either by governmental action or technical difficulties, the value of increased natural rubber imports will be even further enhanced.

New Prices for Synthetic and Natural Rubber

New lower prices for government synthetic rubbers GR-S, GR-I, and GR-M of 36, 33, and 45¢ a pound, respectively, effective April 1, were announced March 8 by Price Administrator Prentiss B. Brown. Most of the synthetic rubber produced in 1943 will be required for military purposes. At the same time it was announced that Rubber Reserve's selling prices of crude rubber will be based on 40¢ a pound for No. 1X ribbed smoked sheets from April 1 for all uses other than for civilian goods. This price reflects only in part the higher costs of imported crude from most sources now available as compared with the costs of Far Eastern rubber from which the stockpile of Rubber Reserve was built up, it was stated. These new prices for crude rubber, which were agreed upon by Secretary of Commerce Jesse Jones and Rubber Director William M. Jeffers, will not require increased ceiling prices for civilian goods since sufficent rubber is to be made available to manufacturers to enable them to sell their permitted allotments of civilian goods within the established price ceilings. Since higher price ceilings will be set for direct and indirect sales of rubber products using crude rubber to the federal government, the OPA on March 29 authorized sales agreements for future delivery of rubber products on government orders to be made for prices higher than maximums now in effect. However, no deliveries are to be made at prices in excess of ceiling actually in effect when the rubber goods are delivered. Tires and tubes made wholly or in part of GR-S rubber sold for original equipment on vehicles that the War and Navy Departments, Marine Corps, Coast Guard, or Maritime Commission has contracted to buy are exempt from price control until June 1, 1943, according to Amendment 2 to MPR 119. This action is to facilitate experiments with these products and afford OPA time to obtain information needed for fixing fair maximum prices. The prices of scrap rubber sold by Rubber Reserve will remain at present levels at least until July 1; therefore ceilings on reclaimed rubber and products made from reclaim remain unchanged.

On March 23, Rubber Reserve Co. Circular No. 17 on the Distribution of Rubber was issued and revealed further that the price changes were to be made as painless as possible by permitting manufacturers to build up a 60-day working inventory of rubber as of March 31 if they filed their requests with the Office of the Rubber Director by April 1. After this date, owing to the necessity of balancing and conserving the stockpile and the uncertainty as to the types and grades which will be available, purchase permits for crude rubber will show only the total amount of rubber authorized by the Office of the Rubber Director, and the selling price will not be specified thereon. Either the word "Civilian" or "Non-Civilian" will be typed on the purchase permit, to designate the applicable price. Another important change in this latest Rubber Reserve circular is that the services of the rubber trade brokers or dealers may be utilized by purchasers of government synthetic rubber from agents of the company (operators of government owned synthetic rubber plants). Circular No. 9, September 28, 1942, required that all sales of government synthetic rubber be made through the Rubber Reserve Co. direct or these agents.

Other Developments

It was announced March 1 that WPB Chairman Donald Nelson had amended his Order No. 2-79 of February 18 in which Rubber Director Jeffers was listed as reporting to Vice Chairman Charles E. Wilson, with Order No. 2-80 to have Mr. Jeffers report direct to the chairman of the WPB. This change was understood to have been made at Mr. Jeffers' insistence that the wording of the original Presidential directive made the Rubber Director responsible solely to the WPB chairman. Order No. 2-85 issued March 19 further confirmed this move.

Early in March sites for five more new industrial alcohol plants to operate on grain were revealed by the WPB. These plants are designed to produce a minimum of 36,000,000 gallons per year on the basis of recovery of feed values for livestock, and the output from these plants will bring the country's alcohol production to a point where all projected requirements can be supplied, including the heavy demands for synthetic rubber. At the same time the recommendations of the Baruch Report for 100,000,000 gallons annually of new capacity will be substantially fulfilled by these plants and by new capacity previously authorized. It should also be mentioned that the Agricultural Sub-Committee of which Senator Gillette is the chairman has been very active in seeing that this particular recommendation of the Baruch Report was carried out. The plants, to be in Wisconsin, Iowa, and Illinois, will probably be operated by Joseph E. Seagram & Sons, Inc., Schenley Distillers Corp., Hiram Walker & Sons, Ltd., and two farmers' cooperatives, the Iowa Farm Processing Cooperative, Eagle Grove, Iowa, and the Consumers Cooperative Association, North Kansas City, Mo.

Standard Oil Co. of California has begun construction of a synthetic rubber plant to cost $6,200,000 on a letter of intent from the Defense Plants Corp. Details are lacking, but the Rubber Director's Progress Report No. 2 indicated two petroleum base and one alcohol base butadiene plant and one copolymer plant in this area. This company also formed a new subsidiary, Oronite Chemical Co., to begin operations March 1 in research, manufacture, and marketing of a wide variety of industrial chemicals.

A critical situation in vegetable oils which became known during the month has made the future of some recently developed chemurgic rubbers rather doubtful.

CALENDAR

Apr. 2.	R. I. Rubber Club. Narragansett Hotel, Providence, R. I.
Apr. 3.	Conference on Rubber Elasticity. Polytechnic Institute of Brooklyn, N. Y.
Apr. 9.	Rubber & Plastics Division, Montreal Section, S. C. I. McGill University.
Apr. 12-13.	Industrial Accident Prevention Assns. Annual Convention. Royal York Hotel, Toronto, Ont., Canada.
Apr. 13-16.	AMA Annual Packaging Conference and Exposition. Hotel Astor, New York, N. Y.
Apr. 15-16.	Rubber Division, A. C. S. Spring Meeting. Book-Cadillac Hotel, Detroit, Mich.
Apr. 30.	Chicago Rubber Group. Morrison Hotel.
May 5-6.	SAE Natl. Transportation and Maintenance Meeting. Hotel Pennsylvania, New York, N. Y.
May 24-26.	National Association of Purchasing Agents. Annual International Convention. Hotel Waldorf-Astoria, New York, N. Y.

Synthetic Rubber Prices Down; Other OPA Acts

New prices for synthetic rubber, effective April 1, were announced March 9 by Price Administrator Prentiss M. Brown. These new prices, agreed upon by Secretary of Commerce Jesse Jones, Rubber Director William M. Jeffers, and the Price Administrator represent substantial reductions from previous levels. The new prices and the higher ones they supersede follow:

	New Prices (per Pound)	Former Prices (per Pound)
GR-S (Buna-S)	36c	50c
GR-I (Butyl)	33c	35c
GR-M (Neoprene)	45c	65c

Mr. Brown stated that according to information received from the Rubber Director most of the synthetic rubber produced in 1943 will be required for military products.

Rubber Reserve Co.'s selling prices of crude rubber will be based on 40¢ per pound for 1X ribbed smoked sheets from April 1, 1943, for all uses other than civilian goods. This price for crude rubber reflects only in part the higher costs of imported crude from most sources now available as compared with the costs of Far Eastern rubber from which the stockpile of Rubber Reserve Co. was built up.

"The changes in prices of rubber will have no effect upon the cost of living," stated Mr. Brown. "Ceiling prices on civilian rubber products such as truck, bus, and tractor tires and tubes, recapped tires, rubber footwear, rubber drug sundries, and the like, will not need to be increased since I am assured by the Rubber Director and Rubber Reserve Co. that rubber to be made available to manufacturers will enable them to continue to sell their permitted allotments of civilian goods within established ceilings."

The prices of scrap rubber sold by Rubber Reserve Co. will remain at present levels at least until July 1; therefore ceilings on reclaimed rubber and the products made from reclaim remain unchanged.

OPA will revise its present ceilings on rubber products for use of the federal government so as to reflect the changes in the prices of rubber.

The differentials between the new prices for the various synthetic rubbers and crude rubber were set in accordance with the recommendation of the Rubber Director. They are designed to bring the prices of these various materials into line with each other, taking into account differences in specific gravity and costs of processing. The government stockpile of crude rubber is steadily diminishing, and the production of synthetic rubber is increasing, thereby necessitating the establishment of a closer relation between the prices of these commodities.

Orders Affecting Rubber Goods' Prices

A minimum discount to dealers of 20% from maximum prices for retreading or recapping rubber tires has been established to safeguard dealer distribution of such tires and services, especially in regions where recapping facilities are not available. Discounts of more than 20%, but not more than 35%, are established as minimum discounts for those who allowed them on December 1, 1942. This action was taken in Amendment 1, RPS 66, as Amended—Retreaded and Recapped Rubber Tires and the Retreading and Recapping of Rubber Tires, effective March 18.

Amendment 8 to RPS 63—Retail Prices for New Rubber Tires and Tubes—effective March 6, establishes specific maximum retail prices for several sizes of brands of truck tires of the Dayton Rubber Mfg. Co., Dayton, O., and the United States Rubber Co., New York, N. Y., and for a quantity of passenger-car inner tubes of the Polson Rubber Co., Garrettsville, O. (the latter covered in Order 1 under MPR 143). The prices for the Dayton and U. S. Rubber tires are for new sizes or brands that did not appear on their November 25, 1941, price lists, and whose maximum prices, therefore, cannot be determined by the ordinary formulas in the schedule.

Order 1 under MPR 143 — Wholesale Prices for New Rubber Tires and Tubes—effective March 6, approves maximum wholesale prices for passenger-car tubes marked "Type B" of brands of The Polson Rubber Co., Garrettsville, O., and sold to the Firestone Tire & Rubber Co., Akron, O.

Amendment 4, MPR 220—Certain Rubber Commodities—effective March 1, adds to the articles covered by the regulation: hospital sheeting and blankets, and pillow cases, all of coated fabrics, and the following sanitary treated items: baby bibs and pants, crib sheets, diaper and utility bags, diaper covers, mattress covers and coveralls, nursery hospital sheeting, and nursery seat rings.

On March 1 a third amendment was added to both MPR 300—Maximum Manufacturers Prices for Rubber Drug Sundries—and MPR 301—Retail and Wholesale Prices for Rubber Drug Sundries. The amendment to 300 sets maximum distributors prices for rubber druggists sundries. Amendment 3 to both orders removes from the lists of druggists sundries covered by the orders several products transferred elsewhere (see, for instance, Amendment 4 to MPR 220), adds the word rubber to such products as funnels, orthopedic pads and parts, spatulas, and thermometer cases, and adds the following classification: "all other rubber articles and parts for medical, surgical, orthopedic, pharmaceutical and laboratory purposes, provided that rubber is the component material of chief weight. Certain definitions are also modified in both orders.

A correction to Amendment 3, MPR 300, applying to footnote 5, was issued March 12.

Order 320 under 1499.3 (b) of GMPR, effective March 9, adjusts maximum prices for sales of Pliocote by the Goodyear Tire & Rubber Co., Akron, O.

Order No. 1 under 1315.21a (e) of MPR 149 — Mechanical Rubber Goods — issued March 5, relates to maximum prices for pressure-sensitive adhesive tape made by the Bauer & Black Division of the Kendall Co., Chicago, Ill.

Order 318 under 1499.3 (b) of GMPR, issued March 6, sets maximum prices which Wishnick-Tumpeer, Inc., New York, N. Y., may charge for Extendex C.

Tire Eligibility Rules

On information supplied by OPA, the Office of War Information on March 9 released a recapitulation of eligibility rules governing the procurement of tires and recaps. The desire to have car owners recap their tires in time so that a potentially recappable tire is not lost entirely, was the chief reason for freeing passenger-car tire recapping from rationing restrictions. This step has been made possible by control of mileage of passenger cars through gasoline rationing.

1. Passenger Cars. There is no restriction on recapping passenger-car tires with "passenger type camelback", which is made of reclaimed rubber only, using no crude. All passenger cars are also eligible for some type of replacement tire if their present tires are not recappable. The grade of tire for which a car is eligible depends upon the gas mileage allowed that vehicle.

2. Trucks and Trailers included in the List A eligibility classification in OPA's regulations are eligible for new crude rubber tires if their present casings cannot be recapped. Trucks and trailers performing important services not on List A may apply for certificate for recapping with "truck-type camelback", which includes a certain amount of crude rubber. Truck tires cannot be made or recapped with reclaimed rubber only.

3. Taxis operating under ODT rules are eligible for truck-type recapping or for new tires if their casings are not recappable.

4. Buses. Public buses operating regular routes and services and private buses performing certain necessary transportation services are eligible for recapped or new tires.

On Tire Rationing

Ration Order 1A—Tires, Tubes, Recapping, and Camelback—last month was subject to further revisions. Amendment 14, effective March 1, withdraws the effective date, March 1, of the changeover from the Revised Tire Rationing Regulations to RO 1A for United States territories and possessions. In these areas tires, tubes, and recapping materials will continue to be rationed under the Regulations pending completion of studies to determine what changes, if any, are needed. Individual rationing plans to fit the conditions peculiar to each area are being considered. The fifteenth amendment, effective March 2, relates to reviews by a hearing commissioner for any person against whom an order has been issued after February 28, 1943, and also to authority of regional administrators and state directors to revoke certificates. The next amendment, in line with the government's plans to keep the nation's automobiles rolling, makes available April 1 additional pre-Pearl Harbor and "Victory" tires to drivers with a mileage ration of more than 240 miles monthly, for replacement of tires worn beyond the recapping stage. Previously only those with a monthly mileage of over 560 could get new tires. Now, however, those drivers of the

lower mileage may get Grade II tires; while motorists with mileage rations between 560 and 1,000 monthly may secure Grade I tires, which previously had been reserved for cars with a ration of more than 1,000 miles or more a month. Amendment 16 also adds all passenger-car tires that fit a 17-inch rim to the list of obsoletes, which formerly had included only casings with a rim size of 18 inches or more. Amendment 17, effective March 25, decrees that hereafter farm tractor and implement tires be recapped only with a material made almost entirely of reclaimed rubber, and replacements will not be issued for recappable tires. Also hearses, which heretofore had been able to get only recapping services, are now eligible for replacements when their casings are not recappable. The eighteenth amendment, effective March 30, permits tire and tube rationing certificates to be used at any time convenient to the holder rather than within 30 days after date of issuance, as originally.

A correction to Amendment 13, RO 1A, issued March 12, refers to tires with which a dealer or manufacturer may replenish—as "Any size Grade III."

Secretary of Commerce Jones announced that the Federal Reserve Bank has issued more than 2,500,000 checks or acknowledgments of gifts to owners of the tires and tubes turned in to Defense Supplies Corp. under the Idle Tire Purchase Plan Program inaugurated in October, 1942. In many parts of the country the appraisal and payment or acknowledgment of tires turned in through the Railway Express Agency have been completed; while in other areas the volume is so heavy that the appraisers and the banks are considerably behind in appraising, recording, and paying for the tires. It is expected that the appraisal work will be completed everywhere within the next few weeks, and payment will follow soon thereafter, the announcement said.

Important savings in tires, gasoline, and automobile wear are being achieved by states in organized efforts to reduce the mileage of state-owned and operated vehicle, under the Government Mileage Conservation Program organized by the OPA, which is a voluntary effort on the part of the states to cut by at least 40% the mileage of nearly 750,000 motor vehicles owned by the various government units throughout the country.

President F. D. Roosevelt on March 1 requested each federal department and agency to appoint a mileage administrator to organize and control the use of that agency's motor vehicles to reduce the mileage of all government cars by at least 40%. The President urged that appointed mileage administrators be given authority to supervise the use of government and privately-owned or leased vehicles—passenger cars, trucks, motorcycles—driven in the federal service. The men appointed should immediately begin comprehensive studies of the use of all rubber-borne vehicles in their departments and take steps to eliminate unnecessary driving. Price Administrator Brown said the President had asked him to supervise the conservation plan and coordinate the work of federal mileage administrators.

An urgent plea to the 1,067,000 car owners of Greater New York to recap worn tires immediately was issued March 17 by K. R. Schaal, vice chairman of the New York State Committee of National Institute for Retreading Standards, division of the National Association of Independent Tire Dealers, Inc. Government rubber and transportation officials estimate that approximately 32,500,000 tires on passenger cars in the United States need recapping. This figure represents 25% of the estimated 130 million tires on the 26 million passenger cars in operation at the beginning of 1942. The government is vitally interested in keeping passenger cars rolling and preserving the tires on these cars, Mr. Schaal pointed out, and by recapping tires in time, a serious breakdown in transportation facilities in the future can be averted.

Other Rulings

Amendment 136 to Supplementary Regulation 14 to GMPR—Modification of Maximum Prices for Certain Commodities, Services and Transactions, New Commercial Vehicles—effective March 13, relates to standard delivery operations, as also in Conservation Order M-216-A, required before a vehicle is delivered to a buyer in order to insure maximum and efficient service. Among the operations covered are tire rim inspection and rust removal; mounting of tires and their proper inflation; installation of fully charged battery; cleaning of cables and connections; inspection of all water hose connections, oil and fuel lines for leakage; inspection of inner tubes and tire casings; recementing of any sponge rubber seal strips that may have pulled loose and replacing any which have deteriorated.

SR 14 to GMPR, Amendment 139, effective March 30, establishes a special formula for computing labor costs to aid molded vulcanized vegetable oil producers determine maximum prices for new products requiring special hand labor. As an example are cushions for billiard tables to replace rubber; excluded, however, are truss pads, which are covered under the rubber druggists' sundries regulation.

Amendment 1 to Order 72 under 1499.3 (b) of GMPR specifies prices at which Vulcanized Rubber Co., Morrisville, Pa., may sell Cole-mor-ite plastics.

Price control over sales of calcium carbide by the Defense Supplies Corp. to other government agencies and to Lend-Lease purchasers was removed February 16 under Amendment 10 to Supplementary Regulation 4 to GMPR. Calcium carbide, used in the production of synthetic rubber, has been purchased from producers and stockpiled by the DSC to insure an adequate supply for the synthetic rubber program. Except for sales made for the synthetic rubber program, prices for sales of this vital material have been controlled by the General Maximum Price Regulation. Warehousing costs incurred by the DSC pending the development of the synthetic rubber program resulted in a "loss" to the agency when it sold to other agencies to keep some of the supplies moving. So that the excess costs will be borne by the purchasing agency or government, OPA granted the request from DSC for removal of the ceilings on this type of sale. However, action taken in Amendment No. 21 does not affect sales made by DSC to commercial users. These sales remain under GMPR. Sales of calcium carbide for use in the synthetic rubber program previously were exempted from price control by Amendment 7 to Supplementary Regulation No. 1 of GMPR.

MPR 28, effective February 27, relates to maximum prices for ethyl alcohol, except West Coast ethyl alcohol. The latter is covered by MPR No. 295.

MPR 344, effective March 19, sets maximum prices for new cotton, linen, and underwear cuttings.

MPR 345, effective March 22, establishes maximum prices for sales of thermoplastic scrap.

MPR 347, effective March 26, sets, at a slight increase above previous levels, maximum prices of domestic wet and dry ground mica and mica schist, waterwashed mica, and micronized mica.

The Office of Defense Transportation, Washington, D. C., is distributing gratis a "Report on Reconditioning Brake Drums, Limits and Tolerances," prepared for ODT by the Society of Automotive Engineers. It was written for truck operators troubled by faulty braking, excessive wear on tires, and too many layups for brake relining, all often caused by poor condition of brake drums. In such instances the hazard of uneven or locking brakes, the waste of rubber, and loss of time can usually be cured by reconditioning the drums. The SAE study shows that drums properly conditioned within the recommended limits are as safe in operation as new ones, that their total life may be extended as much as 80%, and that the drums may be reconditioned any number of times as long as the total metal removed does not exceed 25% of new drum thickness.

The ODT is urging increased use of bicycles, especially those stored away, in order to effect savings in transit equipment, rubber, and gasoline. The purchase of bicycle tires and parts is not subject to rationing restrictions, and a sufficient supply of these products is on hand to take care of estimated necessary reconditioning.

General Order ODT 34, issued March 11, relates to Certificates of War Necessity for commercial motor vehicles in Puerto Rico, as applied to motor fuel and commercial vehicle parts, tires or tubes.

United States Department of Agriculture, Washington, D. C., on March 19 issued Food Distribution Orders 34, 35, 36, 38, and 39, relating to the use and distribution of glycerine, rapeseed oil and mustard seed oil, cashew nut-shell liquid, palm oil, and tung oil, respectively. Among the uses covered are for synthetic resins, ester gums, rubber products, adhesives, rubber factice, rubber substitutes, plasticizers, protective coatings, molding resins for insulating aviation electrical parts, resin solutions for impregnating electrical coils, brake linings or other friction elements, and food container linings.

WPB News

Additional changes have been made to the rubber control order, Supplementary Order M-15-b, as Amended December 28, 1942. The third amendment, released March 1, permits limitation, by special directives of the Director General for Operations or the Rubber Director, on the consumption of crude rubber, latex, reclaimed rubber, scrap rubber, or balata to fill war orders. Amendment 4 excludes from the order Massaranduba balata and Peruvian F. A. Q. white balata which were not in deresinated form prior to March 5 (date of the amendment) as they have been found unsuitable for use in manufacturing goods essential to the war effort. Importation is controlled by amendment to General Imports Order M-63.

Rubber Director William M. Jeffers on March 20 announced the release from inventory of enough wide-base tires to equal the amount of parts in manufacturers' hands to complete fabrication of between 13,000 and 14,000 farm tractors. This action, designed to balance out the wide-base tires in inventory and the parts already in manufacturers' hands, will not require new production of rear, large sized tires, but will only necessitate manufacture of between 3,000 and 4,000 small front-wheel tires to complete the machines. A schedule has been arranged between various farm machinery manufacturers; so each will share the materials to be made available on an equitable basis. The tractor manufacturers will file formal appeals with the Farm Tire Machinery branch of the Office of Rubber Director for allocations of tires, and approvals will be forwarded by wire to facilitate completion and delivery of the needed farm equipment. It is anticipated that this action by the Office of Rubber Director will be of material assistance in releasing completed farm implements in time for spring plantings.

Suspension Order S-258, in effect from March 24 to June 24, 1943, was issued against Meyer Dorfman, doing business as Real Form Girdle Co., 218 Bedford Ave., Brooklyn, N. Y., for unauthorized use of rubber yarn in making girdles, in wilful violation of Conservation Order M-124, as Amended August 26, 1942.

Allocation Order M-106, as Amended.—Seedlac—replacing Conservation Order M-106, clarifies wording and definitions of the latter. The amended order continues control of shellac, but excludes lac after it has been incorporated into protective or technical coatings or molding compounds or after it has been mixed with certain solvents or has been made an integral part of some article.

Amendment 1, Conservation Order M-104, as Amended January 1, 1943—Closures for Glass Containers—issued March 15, revises Schedule V, Home Canning Closures, including those of tinplate, rubber, or wire bails.

To prevent the indiscriminate stripping of new vehicles to supply parts for emergency use, WPB has issued Conservation Order M-216-B, which provides that unless compliance is first made with Ration Order 2B no person may convert any reserve new passenger automobile to any other model or type or remove any standard equipment or other part, the removal of which will impair the operating efficiency of the vehicle. As to reserve new commercial vehicles, which include all types of trucks and trailers, the order prohibits the removal of any standard equipment or other part, the removal of which will impair the operating efficiency of the vehicle. The order permits two exceptions: (1) Electric storage batteries may be removed from a vehicle if batteries of at least equal quality and capacity are installed in the vehicles upon delivery to consumers. (2) Rubber tires, casings, and tubes may be removed from both reserve new passenger automobiles and reserve new commercial vehicles, but only for storage or in exchange for similar equipment and then only upon compliance with Ration Order 1-A.

General Conservation Order M-286—Specialty Papers—issued March 17, prohibits non-essential uses of certain specialty papers (glassine, greaseproof and vegetable parchment) used in wrapping. Included under the ban are rubber and rubber goods except when sterilized in the package and plastics and plastic products except when sterilized in the package.

General Preference Order E-9, issued March 10, limits the sale and the purchase of precision measuring instruments and testing machines. Included are: balancing machines, bench centers, comparators, dividing machines, gaging machines, hardness testers, light wave measuring instruments and devices, measuring machines, physical testing machines, super micrometers, surface measuring instruments, and toolmakers microscopes—if each has a retail sales price of $200 or more. Excluded from the terms of the order are automotive maintenance equipment, precision devices designed specifically for laboratory use, and repair or maintenance parts for precision measuring instruments or testing machines. Order E-9 supersedes General Preference Orders E-1-b and E-5 as to precision measuring instruments and testing machines.

Limitations on the use of antimony in the production of automotive batteries and alloys were removed, and the weight-limit for small deliveries of antimony to any one person substantially increased, under General Preference Order M-112, as Amended March 8, 1943. Restrictions previously applied to the antimony content of inorganic pigments, toys, decorative objects, and ornaments remain unchanged, but unallocated deliveries to individual customers, which have previously been restricted to 25 pounds or less of contained antimony from all sources during any one month, will now be permitted up to a total of 2,240 pounds, or one long ton, in each monthly period.

Preference Order M-227, as Amended March 5, 1943—Copper Chemicals—places allocations of such materials on a quarterly instead of a monthly basis. Copper chemicals are widely used in a number of industries including the production of synthetic rubber, dyes, and pigments.

Priorities Regulation No. 3, as Amended March 9, 1943, further simplifies application of preference ratings to telephone and telegraphic orders for scarce materials. Another change in the regulation makes it clear that maintenance, repair, and operating supplies were to be obtained prior to March 31 by extension of preference ratings, but after that date these materials must be obtained as provided by Controlled Materials Plan Regulation No. 5.

The Container Coordinating Committee has issued specifications that prescribe the proper methods of packing war materials for overseas shipment, which appear in the booklet, "Army-Navy General Specifications for Packaging and Packing for Overseas Shipments," for distribution to manufacturers and shippers engaged in the war program. The booklet is for use by the armed forces, war agencies, and contractors. All shipments of war materials and supplies must comply with the requirements and instructions given in this pamphlet.

Executive Changes

Preliminary to a regrouping of staff functions, the WPB announced the appointment of three new vice chairmen and a new executive assistant. Ralph J. Cordiner, Director General for War Production Scheduling, has been made a vice chairman and will serve as a special assistant to Charles E. Wilson, executive vice chairman. J. A. Krug, Director of the Office of War Utilities, has been named vice chairman in charge of materials distribution, also chairman of the requirements committee, but will continue to serve as war utilities director. Donald D. Davis, recently director of the Program Bureau, has been made vice chairman for operations. Curtis Calder, Director General for Operations, becomes executive assistant to Mr. Wilson. William L. Batt continues as a vice chairman, and Col. Robert E. Johnson, head of the Smaller War Plants Corp., remains as deputy chairman.

Roswell C. Mower, deputy director of the WPB Containers Division, has been appointed director, to succeed Charles L. Sheldon, who resigned, effective February 28. Mr. Sheldon will return to the Hood Rubber Co., Watertown, Mass., where he is purchasing agent.

Smith Johnson, former assistant manager of priorities of the Office of the Rubber Director, has been appointed chief of the Steel Drums, Cylinders & Tight Cooperage Section of the Containers Division of the WPB. Mr. Johnson succeeds Charles Daily, who resigned to become general manager of the Overseas Steel Container Corp., a newly formed company.

United States Department of Commerce, National Bureau of Standards, Division of Trade Standards, Washington, D. C., is circulating to the industry for written acceptance "Tire Repairs (Vulcanized)—Recommended Commercial Standard, TS-3452." This standard has been approved by representatives of repair material manufacturers and tire repair shops and users and is authorized for circulation to the trade for acceptance as a basis for publication by the National Bureau of Standards.

OHIO

Miles M. Zoller

The Eagle-Picher Lead Co., Cincinnati, has elected Miles M. Zoller a director to succeed A. Kiefer Mayer, resigned. Since June, 1938, Mr. Zoller has served as vice president of the Eagle-Picher Sales Co. and as general manager of the Pigment & Oxide Division, a post he still retains, supervising all divisional operations, including the manufacture and sales of the broad line of lead and zinc oxides and pigments. Mr. Zoller joined the pigment division on October 10, 1921, immediately after graduating from Massachusetts Institute of Technology.

The Eagle-Picher Lead Co., moreover, on March 25 held its annual stockholders' meeting at which T. Spencer Shore was elected a director. Mr. Shore is treasurer and a vice president of The General Tire & Rubber Co., Akron, and a director of Standard Steel Spring Co., Coraopolis, Pa. Until recently Mr. Shore had also been chief of the WPB Bureau of Industry Advisory Committees.

The Akron Standard Mold Co., Akron, last month held a board meeting to fill vacancies caused by the recent death of President A. J. Fleiter. Walter P. Voth, formerly vice president and a director, was elected president and general manager; while J. I. Barnby was made secretary-treasurer. Other appointments follow: vice president and factory manager, Frank Behra; sales and advertising manager, Ward W. Sigler; chief engineer, C. B. Hudson; production superintendent, J. F. Fitzpatrick.

Seiberling Rubber Co., Akron, according to Advertising Manager G. F. Weisenbach, has put Douglas Mueller, for the past year in charge of advertising production and purchase, in charge of public relations and advertising copy. His former duties have been taken over by F. K. Tuttle, at one time buyer of advertising material for The Firestone Tire & Rubber Co.

Goodrich Opens Cuban Bus and Truck Tire Factory

A new rubber factory in Cuba, Compania Gomera Goodrich Cubana, S. A. (Goodrich Rubber Co. of Cuba), has been completed and is in operation under the control and supervision of The B. F. Goodrich Co., Akron, according to an announcement on March 19. Built in Puentas Grandes (Big Bridge), a suburb of Havana, the factory and equipment cost approximately $1,000,000.

The project was begun in 1940, but halted temporarily by the war, John L. Collyer, Goodrich president, said, adding that "not until our government had satisfied itself that manufacturing in Cuba would help maintain the economy of that country and contribute to the war effort was production started."

Products of the factory during 1943 will be exclusively truck and bus tires and tubes and tire repair materials, including camelback, but tires only in sizes most essential to maintenance of the essential transportation services of Cuba will be made. Cuba has an excellent paved highway system and is dependent on motor vehicles for essential services.

Crude rubber which the factory will use was on hand in Cuban warehouses long before December 7, 1941, having been purchased and stored in anticipation of requirements. No other crude rubber will be necessary this year. Operation of the factory means that Cubans will produce nearly all their own heavy-duty truck and bus tires for essential operations.

The Cuban company now has 200 employes, including office and sales staff. The organization is headed by Russell F. Moody, vice president and general manager. C. W. Beaman, who has had wide experience in the construction and operation of Goodrich plants in other countries, is factory superintendent; D. G. Benson, technical superintendent; C. F. Monroe, general sales manager; and Enrique Eddy, controller.

Personnel Changes

G. E. Brunner, general manager, national sales and service division of Goodrich, has announced the following appointments: E. D. Nathan, transferred from the passenger-car tire merchandising department, now is in charge of division sales promotion. G. G. Zimmerman, in charge of aeronautical sales for the division in Washington, is transferred to Dayton, O., in charge of that activity there. F. T. Marshall succeeds him in Washington and will continue also in charge of the Baltimore office. H. F. Bichsel, Earl Kambrich, and W. E. Ireland have been assigned to the Washington office, Mr. Bichsel on fabric and inflatable products sales, Mr. Kambrich on other aeronautical products, and Mr. Ireland on tire, tube, and accessory sales. A new office is being opened in Atlanta, with Maury M. Calvert, manager. E. E. Bost has joined the Dallas, Tex., staff, in charge of aeronautical and automotive sales in that area.

W. S. Richardson, general manager of Goodrich's industrial products sales division, has announced the following appointments: Chester F. Conner, merchandise manager, Jay E. Miller, sales promotion manager, Harold F. Mosher, manager, special industrial merchandise. Mr. Conner, with Goodrich nearly 33 years, is on the staff of advisers in the Office of the Rubber Director at Washington and has been active in the mill supply organizations. Mr. Mosher, with the company 24 years, was manager of the trade coordination department from 1931 to 1942 and was in Koroseal sales a year prior to his new appointment. Mr. Miller had previously been in charge of advertising and sales promotion on drug sundries.

Grover D. Motherwell has been appointed manager of the Minneapolis district for Goodrich, succeeding the late Arthur J. Martin. A graduate of the University of

Rubber Miscellany in a Recent Shipment from South America, Received by Goodrich

Hand Fashioned Rubber Shoes, Two Small Rubber Water Bottles, a Knife with an Improvised Rubber Handle, and a Big Rubber Ball Used in a Native Game Called "Batos"

Chicago, Mr. Motherwell joined the company in 1928 as a tire salesman in the Chicago district and has held several executive sales posts there, most recently as sales supervisor.

S. A. Walker, manager of the Philadelphia division of the Goodrich industrial products division, last month completed 30 years with his organization.

John S. Gulledge, formerly St. Louis district manager of the Goodrich industrial products division, is now Major Gulledge, executive officer of the Sedalia Army Air Base at Warrensburg, Mo. Major Gulledge, who served with the Marines in the last war, entered active service last year as a captain.

Other Company News

Goodrich in its report to stockholders revealed that last year more butadiene-type synthetic rubber was produced in the plant being operated by its affiliate, Hycar Chemical Co., than in all other plants in the country. During 1942 Goodrich also successfully manufactured Ameripol tires in the smaller sizes, using 99.84% of synthetic rubber.

Goodrich is sponsoring a new coast-to-coast radio program, "The Meaning of the News," Monday through Friday, over the Columbia network. Starting March 15, Joseph C. Harsch, war correspondent and author, broadcasts nightly five-minute interpretations of the news behind the headlines.

John L. Collyer, president of The B. F. Goodrich Co., and chairman of the B. F. Goodrich Rubber Co. of Canada, Ltd., Kitchener, Ont., addressed the Kitchener Rotary Club on March 1. He stated that Canadian production of synthetic rubber this year and next will be an important factor in the plans of the United Nations.

The Civil Aeronautics Administration has approved, for the first time, the use of tires made with synthetic rubber on commercial airline planes, it was announced March 11 by J. S. Pedler, manager of Goodrich's aeronautic division. This approval was based on results of extensive tests of this kind of synthetic tires made by Goodrich, plus the performance of other types of synthetic tires which it has produced and which are at present in actual service.

The Mohawk Rubber Co., Akron, through President Ray E. Bloch, has announced the appointment of John J. Singleton as sales manager. He has been in the rubber industry 19 years, the last 14 of which with Mohawk. James R. Broch, who joined the company in 1931 and who had been advertising manager, has been made purchasing agent, succeeding C. D. Bucher.

The Firestone Tire & Rubber Co., Akron, recently held a directors' meeting at which Russell A. Firestone was elected assistant treasurer. Mr. Firestone, who had been general manager of the Nebraska Defense Corp., Firestone subsidiary, near Omaha, has returned to Akron to assume his new duties.

The Goodyear Tire & Rubber Co., Akron, has developed a new steel cable-carcass V-belt adapted to the engines of military tanks and motorized vehicles and automobiles. Company engineers report that the belt, using endless strands of steel cables in place of conventional cotton cords or fabric, showed, under tests, many times longer service life than cotton-cord belts. Besides the new belt stretches less than a fifth of 1%.

Goodyear also reported that Chemigum is being used for rolls of printing presses. The synthetic is said to swell and distort less than natural rubber or other materials under the influences of inks and cleaning substances.

Goodyear recently revealed that its synthetic rubber, Chemigum, is being used as sealing gaskets within pipe couplings of fuel and water lines for mobile military units. The rubber company is supplying these gaskets to the Gustin-Bacon Mfg. Co., Kansas City, Mo., manufacturer of "Rolagrip" and "Gruvagrip" pipe couplings. Goodyear has pointed out that the Buna N type of Chemigum is well adapted to fuel lines because of its resistance to aromatic gasoline, such as the high-test fuels used for airplanes and armored vehicles.

War steptread cement, to attach rubber to metal, has been developed by Goodyear's development department to replace the regular steptread cement which contained materials no longer available for the duration for non-essential use. The new cement, made of non-strategic materials, may be used also as a bicycle rim cement. It is highly adhesive and resistant to weather exposure and comes in quart bottles and gallon cans.

A. G. Cameron, vice president and general manager of Goodyear's export company, recently celebrated his thirtieth anniversary with the organization.

R. J. Hollinger, division superintendent, and J. A. Pribble, manager of plant engineering and maintenance for Goodyear in England, are on a visit to Akron.

NEW ENGLAND

United Elastic Elects

United Elastic Corp., Easthampton, Mass., met in annual meeting February 16 to elect the following directors: Harold W. Conant, Wm. L. Pitcher, Clifford A. Richmond, Kenneth R. Shaw, George S. Van Voorhis, Arthur N. Hood, W. Elliott Pratt, Jr., and E. Sohier Welch. Officers for the ensuing year are: president and general manager, Mr. Pitcher, who succeeds the late Edward L. Shaw; treasurer, secretary, and assistant manager, Mr. Conant; vice president, assistant treasurer, and chairman of the board, Mr. Richmond; clerk and comptroller, Percy M. McIntosh; sales manager, Mr. Van Voorhis; assistant sales manager, Raymond A. Waite; sales coordinator, Walter E. Dalby; production manager, Wm. A. Herrmann; superintendent, Solomon Kendrick; assistant superintendent, Fred A. Weidhaas; manager dyehouse, John Russell; purchasing agent, Edgar Bergmann; manager, West Haven plant, Edward E. Foster; manager, Littleton and Lowell plants, Stanley F. Conant.

A resolution of appreciation of the late Edward Shaw was adopted at the stockholders' meeting.

United Elastic Corp. is the result of a merger, in 1927, of several companies, including Easthampton Rubber Thread Co., Easthampton; Conant, Houghton & Co., Littleton and Lowell, Mass.; George S. Colton Elastic Web Co., and Glendale Elastic Fabrics Co., both of Easthampton.

At the time of the merger, Mr. Pitcher, had been general manager of Easthampton Rubber Thread, with which he had started in 1891; while Mr. Conant had been general manager of Conant Houghton, which he had joined in 1901. Mr. Richmond had been general manager of the Colton company, but had begun with the Glendale firm in 1892.

Forrest Wickes, formerly with the Hood Rubber Co. and Firestone Tire & Rubber Co., has joined the technical sales staff of the American Resinous Chemical Corp., Peabody, Mass.

The Bristol Co., Waterbury, Conn., has appointed George R. Atkins manager of the branch sales office and factory at 727 Grant St., Akron, O. Mr. Atkins, who joined the company's sales organization in 1929, in its New York office, has since served on the Pittsburgh district sales engineering staff, as resident sales engineer in Greenville, S. C., and then back to the Pittsburgh office.

Joseph L. Haas, of the Hodgman Rubber Co., Framingham, Mass., recently addressed the Framingham Rotary Club on the latest developments in the rubber trade.

MIDWEST

Monsanto Chemical Co., St. Louis, Mo., on March 23 announced the election of Charles Belknap, chairman of the executive committee and executive vice president, to the presidency. Edgar Monsanto Queeny, for 15 years president, becomes chairman of the board, a position vacant since the death, in 1933, of his father, John Francis Queeny, founder and first president of the company. No new executive vice president has been named, but Mr. Belknap will continue as chairman of the executive committee.

James W. Irwin, assistant to the president, on March 11 addressed the Industrial Relations Institute at Edgewater Park, Miss., on "Industry and the Press."

Van Cleef Bros., 7800 Woodlawn Ave., Chicago, Ill., recently celebrated the unique safety record of ten years without a lost-time accident.

EASTERN AND SOUTHERN

U. S. Rubber in Mexico

United States Rubber Co., Rockefeller Center, New York, N. Y., has become associated with Compania Hulera Mexicana S. A., Mexico City, Mexico, manufacturer of "Tornel" tires and tubes, according to L. C. Boos, vice president of United States Rubber Export Co., Ltd.

"Hulera Mexicana is producing a quality tire," Mr. Boos said. "With the present need for utilizing different types of crude and synthetic rubber, however, certain changes in construction and compounding will, of course, be necessary. The United States Rubber Co. will provide the Mexican factory with the benefit of its technical knowledge and experience and manufacturing supervision. In return, the United States Rubber Co. will have available an established Mexican plant providing basic facilities for further development of its business in Mexico, and for the manufacture of products under its trade names.

"Through our sales branch in Mexico City we have for many years sold to the mining, oil and manufacturing industries of Mexico large quantities of rubber goods produced in our plants in the United States.

"In the future a growing proportion of such products will be produced within Mexico, by Mexican workers. This will help Mexico in the development of her industrial resources and will strengthen the spirit of economic cooperation between our two countries."

Other Developments

United States Rubber has announced the leasing of four buildings and the power house of the Hupp Motor Co., Detroit, Mich. The expansion was made necessary, according to Emmet Sheahan, assistant to the president, because of tremendous increases in the rubber firm's war production program. Much of the Hupp space has been converted, and parts for the running gear of United States Army light and medium tanks are already being turned out in volume. New installations of machinery are still being made, however, and an overhead conveyer system is being completed. The plant, when fully converted, will become a major production unit for U. S. Rubber's war output.

Greatly improved methods of manufacture of tank tread parts have been developed and are in operation at the Hupp plant. One important process now takes only one-third the time originally needed and at the same time saves 10% of the rubber once used. Two types of tank treads are being produced.

U. S. Rubber is manufacturing a new type of nylon airplane tire said to be 100% stronger than any previously known. The use of nylon in tires was begun experimentally by U. S. Rubber's Detroit plant many months before Pearl Harbor and has been tested with very good results on long bus runs. The amount of nylon used in one medium-sized tire would make 186 pairs of women's stockings.

General Atlas Carbon Division of General Properties Co., Inc., Pampa, Tex., is erecting two additional units at its Guymon, Okla., plant, which will increase its capacity of furnace-type blacks approximately ten million pounds a year.

Annual Potential Furnace Black Output of 125 Million Pounds

Binney & Smith Co., 41 E. 42nd St., New York, N. Y., one of the major producers of carbon blacks, reported on March 10 definite production plans for 125,000,000 pounds of furnace blacks a year in recommending that users feature these-type blacks in their testing programs for tire treads or other uses. In this connection, the company quotes from a letter of the president of Columbian Carbon Co., as follows:

"Our 1942 sales of furnace blacks showed an increase of 117% over the previous year. We have one furnace black factory in operation at Hancock, La.; another expected to commence operation next month at Fairbanks, Tex.; a third near completion at Eola, La.; and a fourth planned to be in service this autumn at Conroe, Tex. These four plants will have a combined productive capacity ranging from 65 to 85 million pounds per annum, depending upon the types of colloidal carbon manufactured. The furnace process as developed by our company is exceedingly flexible, and admits wide variation in the character of our product. How this production will be divided between Furnex and Statex will, therefore, be determined by the requirements of the synthetic rubber program. If these plants do not suffice to meet the requirements either of Furnex or Statex, the Columbian Carbon Co. is ready to increase production, when and as needed, up to a total of 125 million pounds."

United Fruit Rubber Plantings

In a report of progress in a comprehensive crop introduction and production program to help build up a reservoir of rubber, manila hemp, essential oils, etc. to replace those lost to us by the Japanese invasion of Malaya and Netherlands India, the United Fruit Co., New York, N. Y., revealed recently work with *Hevea* and *Castilloa* trees and *cryptostegia*. In Columbia and Panama, on the request of the United States Government, the company at its own expense is planting an experimental plot of *Hevea* trees. On its own account it has authorized the planting of 500 acres of *Hevea* rubber in Guatemala and has in seed beds about 110,000 young *Hevea* plants which will be budded and transferred to permanent field locations during the present year. Plantings of *Hevea* in Honduras are being extended to 500 acres. A supplemental experiment in the same area includes 150 acres of natural-stand *Castilloa* trees and five acres of cultivated plantings of the same tree. In the Dominican Republic the company has concluded the purchase of large quantities of seed of the *cryptostegia* vine, for delivery to the Rubber Supply Corp.

Rubber in Safety Devices

The Fourteenth Annual Safety Convention and Exposition was held by the Greater New York Safety Council at the Hotel Pennsylvania, New York, N. Y., March 23-24, which attracted a large attendance.

Great strides recently taken by synthetic rubber and neoprene were apparent in many of the safety devices and appliances shown, previously made of natural rubber. The "Dustfoe", a plastic dust respirator with neoprene facepiece and flutter valve, was displayed by Mine Safety Appliances Co., Pittsburgh, Pa., along with a synthetic kneeling pad. Safety First Supply Co., Pittsburgh, showed a resuscitator with neoprene facepiece and theoretical lung, inhalator, and reservoir, all of synthetic rubber where formerly Para rubber had been used. A latex rubber handle was on the lamp guard of Safeguard Electric Co., Inc., Brooklyn, N. Y. An apron of thick neoprene by Pulmosan Safety Equipment Corp., Brooklyn, N. Y., a finger guard with a latex back of Industrial Gloves Co., Danville, Ill., and various synthetic and neoprene acid-resistant gloves and sleeves of The Olympic Glove Co., New York, and Industrial Gloves were among the other exhibits. Also displaying were W. S. Wilson Corp., New York, Davis Emergency Equipment Co., Inc., Newark, N. J., and Lehigh Safety Shoe Co., Inc., Allentown, Pa.

Pulmosan substituted lightweight cotton overalls calendered with a plastic coating for the formerly thick rubber garment, and Klear-Vu Products Co., Newark, had a similar-type resin treated apron; while Davis Emergency featured sleeves, smocks and aprons of Resistoflex. A non-skid safety thread mat of abrasive substituting for rubber was developed by the American Abrasive Metals Co., Irvington, N. J.

Among the many speakers at the convention was E. W. Beck, supervisor of safety, United States Rubber Co., New York, who took part in the panel discussion, "Selling Safety to Management and Supervision."

Foster D. Snell, Inc., consulting service, 305 Washington St., Brooklyn, N. Y., in expanding its rubber and plastic department, has taken on as a research director Theodore G. Sullivan, associated with the rubber industry since 1918, to supervise all problems of the enlarged department. Mr. Sullivan's experience in the rubber field includes work on the design, construction, and operation of an organic rubber solvent recovery plant at the Lewis Recovery Corp.; charge of the rubber division of Wishnick-Tumpeer, Inc., occupied with rubber pigments and colors; founding Vansul, Inc., to promote a patent for rubber dispersed colors and to handle other rubber chemicals, research, development, and factory control; and heading the rubber division of Harmon Color Works.

Willis H. Carrier, chairman of the board, Carrier Corp., Syracuse, N. Y., presented a paper on "How Air Conditioning Has Advanced the Art of Refrigeration" before the West Virginia Section of the American Society of Mechanical Engineers at a recent meeting held in the Daniel Boone Hotel, Charleston, W. Va. Engineering improvements in large refrigeration machines for blackout plants, synthetic rubber processing, and other large-scale war projects were illustrated by Dr. Carrier, who reminded his audience that although air conditioning is usually associated with comfort, today industries as aircraft, munitions, chemicals, and plastics are using air conditioning to increase war production.

Society of Automotive Engineers, Inc., 29 W. 39th St., New York, N. Y., in its March *Journal* reveals that automotive engineers and metallurgists, inspired by wartime shortages of materials, are developing both substitutes and substitutes for substitutes on such a scale as virtually to create a revolutionary new world of American alternate materials. It is reported that in an Army 1½-ton truck 107 items made of rubber, 129 items of copper and copper alloys, 57 of tin and tin-base alloys, and 60 items made of nickel and chromium alloys have successfully been replaced by lead, felt, steel, iron, plastic, zinc plate, leather, cotton, fabric, synthetics, asphalt, paper, and wood, or have been eliminated by redesign.

Federal Trade Commission, Washington, D. C., has issued a cease and desist order against American Industrial Rubber Co., Chicago, Ill., trading and doing business as Nu-Tred Tire Agency, Champion Rubber Co., L. & S. Tire Distributors, and Harvester Tire Sales, and Harold Trilling, Manny G. Tenenbaum, Olin K. Lewis, and E. F. Smith, individually, for misrepresentation of samples, in advertising, and in guarantees of its recapped automobile tires.

Chemical Industries, 522 Fifth Ave., New York, N. Y., has announced the appointment of Robert L. Taylor as editor. He previously had been advertising and public relations manager, Monsanto Chemical Co., St. Louis, Mo., associate editor of *Chemical and Metallurgical Engineering,* New York, and with Sharples Chemical Co., Wyandotte, Mich.

H. K. Porter Co., Pittsburgh, Pa., on April 1 opened a district office in Girard Trust Bldg., Philadelphia, Pa., for eastern Pennsylvania, western New Jersey, Maryland, and Delaware, with Roy B. Rose, an executive of the company's process division, manager for the territory. The company, a manufacturer of industrial locomotives and process equipment, reports that its business in this area has more than doubled in the past year. Increased volume of demand for chemical process equipment in particular and for its new line of wood tank equipment has required the installation of the new offices for the most efficient servicing of customers in the territory. Engineering services for the process lines will be made available.

Composition of GR-I (Butyl Rubber)

The following notice was sent out March 15 by the WPB, Office of the Rubber Director:

"Until you are advised to the contrary, all GR-I (Butyl rubber) made at the government plant in Baton Rouge, will contain 0.5% of the antioxidant phenyl-beta-naphthylamine as a stabilizer.

"Butyl rubber samples which have been supplied in the past have contained either sulphur or zinc oxide or both.

"GR-I from the new plant *will not contain either sulphur or zinc oxide.* It will not contain any other added ingredient except the stabilizer mentioned above.

"For the present all of the Butyl produced will be of the so-called white variety; that is, it will not contain any carbon black."

E. I. du Pont de Nemours & Co., Inc., Wilmington, Del., at its board meeting March 15 reelected all officers as follows: chairman of the board, Lammot du Pont; president, W. S. Carpenter, Jr.; vice presidents, H. Fletcher Brown, J. Thompson Brown, R. R. M. Carpenter, J. E. Crane, A. Felix du Pont, Henry B. du Pont, A. B. Echols, J. B. Eliason, W. F. Harrington, H. G. Haskell, J. W. McCoy, F. W. Pickard, J. J. Raskob, and C. M. A. Stine; treasurer, Mr. Eliason; assistant treasurers, Walter J. Beadle, J. A. Horty, A. B. King, L. S. Munson, Jr., H. B. Robertson, and Maxwell Moore; secretary, W. F. Raskob; assistant secretaries, M. D. Fisher, F. G. Hess, and E. A. Howard.

Thomas F. Callahan, for a number of years sales representative for the Wishnick-Tumpeer, Inc., New York, N. Y., joined the U. S. Navy recently with the rank of lieutenant junior grade.

Tax Economics Bulletin, New York, N. Y., recently reported that federal taxes on tires and tubes (tires, 2½¢ a pound to October 1, 1941, 9¢ thereafter, tubes, 4½¢ a pound to October 1, 1941, and 9¢ a pound thereafter) for 1942 totaled $25,356,781.71, against $71,858,419.90 in 1941, a decrease of 64.7%.

Felix Yerzley, formerly with E. I. du Pont de Nemours & Co., Inc., and then Bendix Aviation Corp., is now planning engineer with Western Electric Co., Kearny, N. J.

CANADA

Dominion Rubber Co., Ltd., Montreal, P. Q., has loaned W. MacLean, assistant to George Bergeron, director of government sales at the company's Ottawa branch, to Polymer Corp., Ltd., Ottawa, for the duration. Mr. MacLean is stationed at Washington, D. C., U. S. A., where he is attached to the Rubber Branch of the War Production Board as joint representative for Canada and the United Kingdom on the synthetic rubber program. Replacing Mr. MacLean at Ottawa is D'Arcy McConvey.

Dr. Liu Shih Shun, first Chinese minister in Canada, of Ottawa, was a recent visitor at the Dominion Tire factory at Kitchener. He was welcomed by Factory Manager Curtis L. Moody and H. W. Appel.

Paul S. Smith, head of the legal department of Dominion Rubber, was recently selected as one of the Canadian Manufacturers' Association representatives on the Montreal City Council.

Naugatuck Chemicals, Ltd., Elmira, Ont., recently expanded the scope of its activities by taking on the Canadian agency for Naugatuck Aromatics, of New York, N. Y., U. S. A., in line with the company plan to diversify its interests.

Goodyear Tire & Rubber Co. of Canada, Ltd., New Toronto, Ont., has named A. W. Denny factory manager of the plants at Toronto, Bowmanville, and St. Hyacinthe, with Harley Allman, plant superintendent at Toronto. Ed. H. Koken, vice president of production, is on leave of absence because of illness.

Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont., has announced that Col. Paul R. Hanson, O.B.E., manager of the Quebec division, is retiring after 33 years with the firm. F. A. Grant, divisional manager in the Maritime provinces for many years, has been placed in charge of the newly formed eastern division of the company, with headquarters in Montreal, P. Q.

More than 90 Dunlop employes with 25 years or more of service to their credit, assembled at dinner February 27 to organize themselves into an active club and to talk over old times. J. I. Simpson, Dunlop president and general manager, presented a number of engraved gold watches for long service. John Westren, formerly with the company, presented Tom Burns, oldest employe in point of service, with 46 roses in acknowledgment of 46 years with the company. Approximately 10% of the Dunlop employes have had more than a quarter-century of continuous service.

Bruce S. Morrow, manager of the Dunlop sporting goods division, addressed the Canadian Bicycle & Sporting Goods Dealers Association at its twenty-sixth annual meeting in Toronto, March 1-2.

Charles S. Band, vice president, Gutta Percha & Rubber, Ltd., Toronto, Ont., in a recent visit to Vancouver, B. C., stated that if synthetic rubber proves as inexpensive to produce commercially as at present thought, crude rubber will have a difficult time competing with it when the war is over. Mr. Band believes that Brazilian crude rubber will not prove a solution of the North American rubber industry's demands even if synthetic rubber failed to be profitable commercially. Developments already established in other production fields could be more readily reestablished after the war than Brazilian expansion.

OBITUARY

Edward L. Shaw

A HEART ailment caused the death, on February 6, of Edward Lyman Shaw, chairman of the board and president of United Elastic Corp., Easthampton, Mass. Funeral services were conducted February 11 at First Church, Northampton, Mass., with interment in Easthampton.

Mr. Shaw was born in Easthampton on August 12, 1875. He attended Williston Academy, Easthampton, and then studied law in the office of Hammond & Field, Northampton. He was admitted to Hampshire County Bar in 1897 and practiced law for several years, serving from October, 1919, to October, 1921, as a Justice of the Superior Court of Massachusetts. The deceased resigned to become vice president of The First National Bank of Northampton and to return to private practice. He was elected the bank's president in 1923, a position he held until his death.

In 1923 he was named a director of Easthampton Rubber Thread Co., in 1926, vice president, and in 1934, president, remaining as such until he died. In 1923, Mr. Shaw was also elected a director and president of Glendale Elastic Fabrics Co., Easthampton. The latter, with Conant Houghton & Co., Littleton, Mass., Easthampton Rubber Thread Co., and the George S. Colton Elastic Web Co., Easthampton, merged in 1927 to form United Elastic Corp., with Mr. Shaw as a director, president, and chairman of the board.

He was, besides, a Mason, a Knight Templar, and an Elk.

Surviving are his wife, a son, and four grandchildren.

Richard De W. Brixey

ON MARCH 14, Richard De Wolfe Brixey, 62, president and treasurer of the Kerite Insulated Wire & Cable Co., New York, N. Y., died at his home in New York. Following his graduation from the Sheffield Scientific School of Yale University in 1902, he entered the Kerite factory in Seymour, Conn. He later came to New York as the firm's general manager.

Mr. Brixey was also president of the Art Centre in New York and of its successor, National Alliance of Art & Industry. Besides he was a member of Chi Phi fraternity and of the Sleepy Hollow Country, Pilgrims, Engineers, Bedford Golf & Tennis, and Yale clubs.

He was born in Seymour, Conn.

Survivors are his wife, a daughter, and a grandson.

M. L. Schilling

ON FEBRUARY 27, Michael L. Schilling, who had represented Brooklyn Color Works, Inc., manufacturer of fine colors, Morgan and Norman Aves., Brooklyn, N. Y., in the metropolitan area, New England, and Atlantic Coast States, passed away. He had been with the company, always in a sales capacity, about 20 years.

Harry E. Drevenstedt

HARRY E. DREVENSTEDT, since March, 1936, vice president of National Carbon Co., Inc., 30 E. 42nd St., New York, N. Y., died February 10 at his home in White Plains, N. Y., after a long illness. He had previously been vice president of Canadian National Carbon Co., Ltd., from June, 1919.

The deceased, born February 4, 1891, in Jamesburg, N. J., was a graduate of Yale University (B. S. in M. E., June, 1913). He belonged to the Electrical Manufacturers Club and the Yale Club of New York and was a director of the People's National Bank of White Plains.

Funeral services were held February 12 at his late residence. Burial occurred in Sumter, S. C.

Mr. Drevenstedt leaves a wife, two daughters, and two sisters.

Arthur Reeve

ARTHUR REEVE, who had been with the United States Rubber Co., New York, N. Y., 60 years when he retired December 31, 1942, died suddenly March 20 in Los Angeles, Calif., where he had gone to live. Born in England 77 years ago, the deceased came to this country when a boy and began working on footwear in the company's Woonsocket, R. I., factory. He in time was put in charge of the manufacture of Woonsocket and Wales-Goodyear shoes and later became assistant general manager and then supervisor of production of the U. S. Rubber footwear division. In 1937 he was appointed traveling general merchandise auditor for the company.

Mr. Reeve, who was influential in educational activities in the communities where he resided, also was a founder and first president (1888-89) of the Auburn Public Library, Providence.

Interment was in Kensico Cemetery, N. Y.

Survivors include the widow and three daughters.

Rubber, Plastics Group

(*Continued from page 61*)

tics Industries Technical Institute; J. H. Teeple, Celanese Corp.; W. A. Zinzow, Bakelite Corp.; Joseph H. Dillon, Firestone; J. C. Travilla, Jr., General Steel Castings Corp.; M. E. Lerner, *Rubber Age*; R. A. North, Farrel-Birmingham Co., Inc.; T. S. Carswell, Monsanto Chemical Co.; and R. G. Seaman, INDIA RUBBER WORLD.

Vinyl Resins Discussed

JOHN D. BENEDITO, of Canadian Resins & Chemicals, Ltd., was the speaker at the March 12 meeting of the Rubber & Plastics Division, Montreal Section, Society of Chemical Industry, held at the Ritz Carlton Hotel. Mr. Benedito covered the properties and industrial applications of the vinyl series and described in detail polyvinyl chloride, acetate, chloride-acetate copolymers, alcohols, and acetals. He gave special attention to the formulation of the copolymers which his company is starting to manufacture in the Dominion. The meeting and the dinner attracted a large attendance including representatives of many American companies.

The April 9 meeting, the final one of the season, will feature election of officers and an open business meeting to precede the talk to be given by H. K. Nason, assistant director of research, Monsanto Chemical Co., who will consider development in the functional utilization of plastic materials.

Shore before Chemical Engineers

AT A meeting of the New York Section of the American Institute of Chemical Engineers, March 11, at the Chemists Club, New York, N. Y., T. Spencer Shore, vice president and treasurer, General Tire & Rubber Co., Akron, O., spoke on "Industry, People and Government." This talk was also given January 12 before a luncheon meeting of the National Federation of Sales Executives in New York and was reported on page 492 of our February issue.

The meeting was in charge of Harry E. Outcault, technical manager of the zinc oxide department of St. Joseph Lead Co., 250 Park Ave., New York.

Rims Approved and Branded by The Tire & Rim Association

Rim Size	Feb., 1943
15″ & 16″ D. C. Passenger	
16x4.00E	9,464
16x4.25E	4,985
16x4.50E	162
16x5.00E	1,259
16x5.00F	7,183
17″ & Over D. C. Passenger	
18x2.15B	13,484
Military	
16x4.50CE	61,512
16x6.50CS	54,293
18x8.00CV	3,969
20x4.50CR	3,570
20x6.00CT	7,423
20x10.00CW	2,278
24x10.00CW	593
Flat Base Truck	
20x4.33R (6″)	5,702
15x5.00S (7″)	6,372
16x5.00S (7″)	783
17x5.00S (7″)	128
18x5.00S (7″)	803
20x5.00S (7″)	271,817
24x5.00S (7″)	1,935
20x6.00T (8″)	36,540
22x6.00T (8″)	4,271
20x7.33V (9/10″)	13,939
22x7.33V (9/10″)	210
24x7.33V (9/10″)	4,388
20x8.37V (11″)	2,058
24x8.37V (11″)	1,306
Semi D. C. Truck	
16x4.50E	3,148
Tractor & Implement	
16x3.00D	1,975
24x8.00T	1,583
Cast	
24x10.00	2
24x15.00	64
TOTAL	527,199

The man who invented the sausage grinder

WOULD NEVER KNOW IT NOW

FOR centuries they had been chopping meat for sausages with knives and cleavers. Then one day an adventurous fellow turned up with a meat grinder, requiring no knives or chopping blocks—you just turned a crank.

The world has never been quite the same since. For the first sausage grinder opened the way for a long line of screw-feed mechanisms, from the coal stoker in your basement to the big rubber strainer shown above.

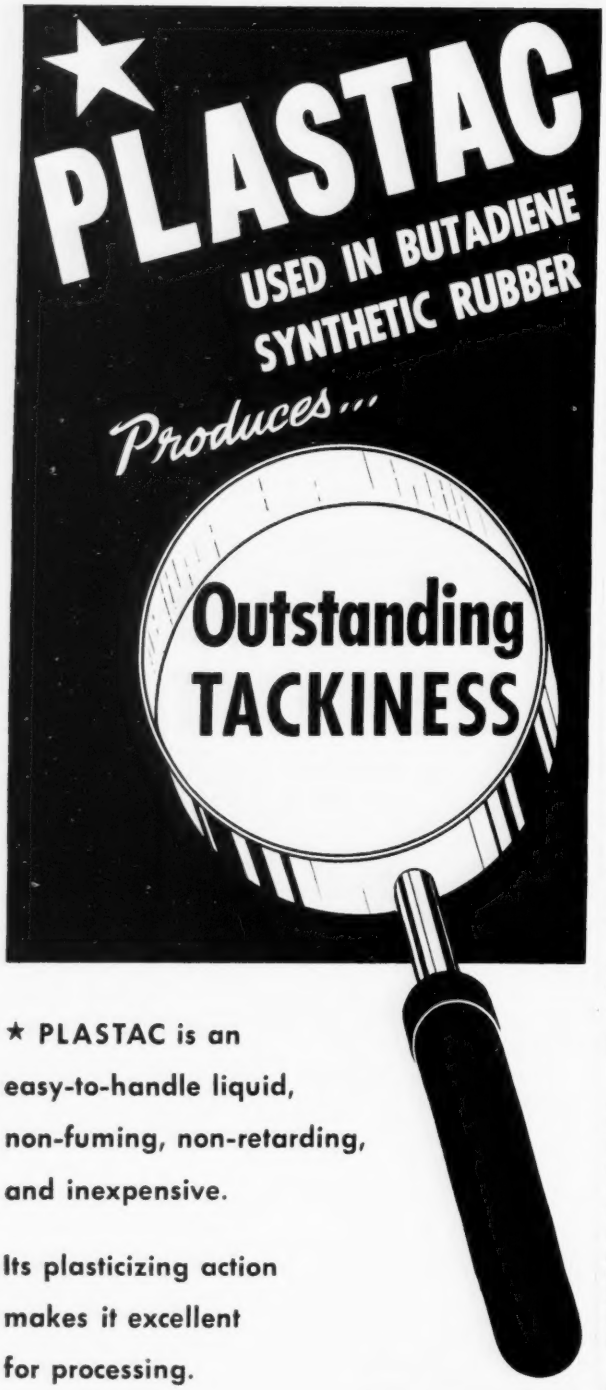
National has been designing and building rubber extruders, or tubing machines, for many years. For the past several years we also have developed, built and installed machines for extruding plastics—more of them than all other manufacturers combined.

From our experience with plastics extrusion we have learned new and important facts that apply to rubber as well. This new knowledge, thoroughly tested and proved, has been incorporated in the design and improved performance of the National tubing machines available today to the rubber industry.

NATIONAL RUBBER MACHINERY COMPANY

General Offices: Akron, Ohio

CREATIVE ENGINEERING



★ PLASTAC is an easy-to-handle liquid, non-fuming, non-retarding, and inexpensive.

Its plasticizing action makes it excellent for processing.

FOR SAMPLES, DATA, AND PRICES WRITE:

ADVANCE SOLVENTS & CHEMICAL CORPORATION
245 FIFTH AVENUE · NEW YORK, N. Y.

EUROPE

GREAT BRITAIN

Warning Strips for Tires

To prevent "war-grade" tires, which are less resistant to wear and strain than peace-time tires, from being worn out to the point where they can no longer be retreaded, the Tire Manufacturers' Conference has decided to put a "warning strip" in the cover of new tires. This is a strip of a special color which shows up as soon as that stage in the wear of a tire is reached when it should be retreaded. The Conference again warns automobile and truck drivers to avoid subjecting the new tires to the strain of high speeds and sudden braking, as they are liable to fail prematurely under these conditions.

Colonial Products Council

A Colonial Products Research Council has been set up under the chairmanship of Lord Hankey. The new organization, formed as a result of recommendations of the Colonial Research Committee appointed last year, is to be an executive body and will initiate and supervise research work on such colonial raw materials as may be useful in the manufacture of intermediate and other products needed by industry. The Council will cooperate as far as possible with existing institutes as the Department of Scientific and Industrial Research, Medical Research Council, and the Agricultural Research Council. The following are members of the Council: Eric Barnard (Department of Scientific and Industrial Research), G. L. M. Clauson (Colonial Office), Aneurin Davies, J. J. Fox (government chemist), W. N. Haworth, Sir Harry Lindsay (Director of the Imperial Institute), Sir Edward Mellanby (Medical Research Council), Sir Robert Robinson, G. W. Thomson and W. W. C. Topley (Agricultural Research Council). Professor J. L. Simonson, until recently of the University College of North Wales, is director of research.

Some of these members of the council are also members of the Colonial Research Committee, and it is planned to maintain close contact with that organization.

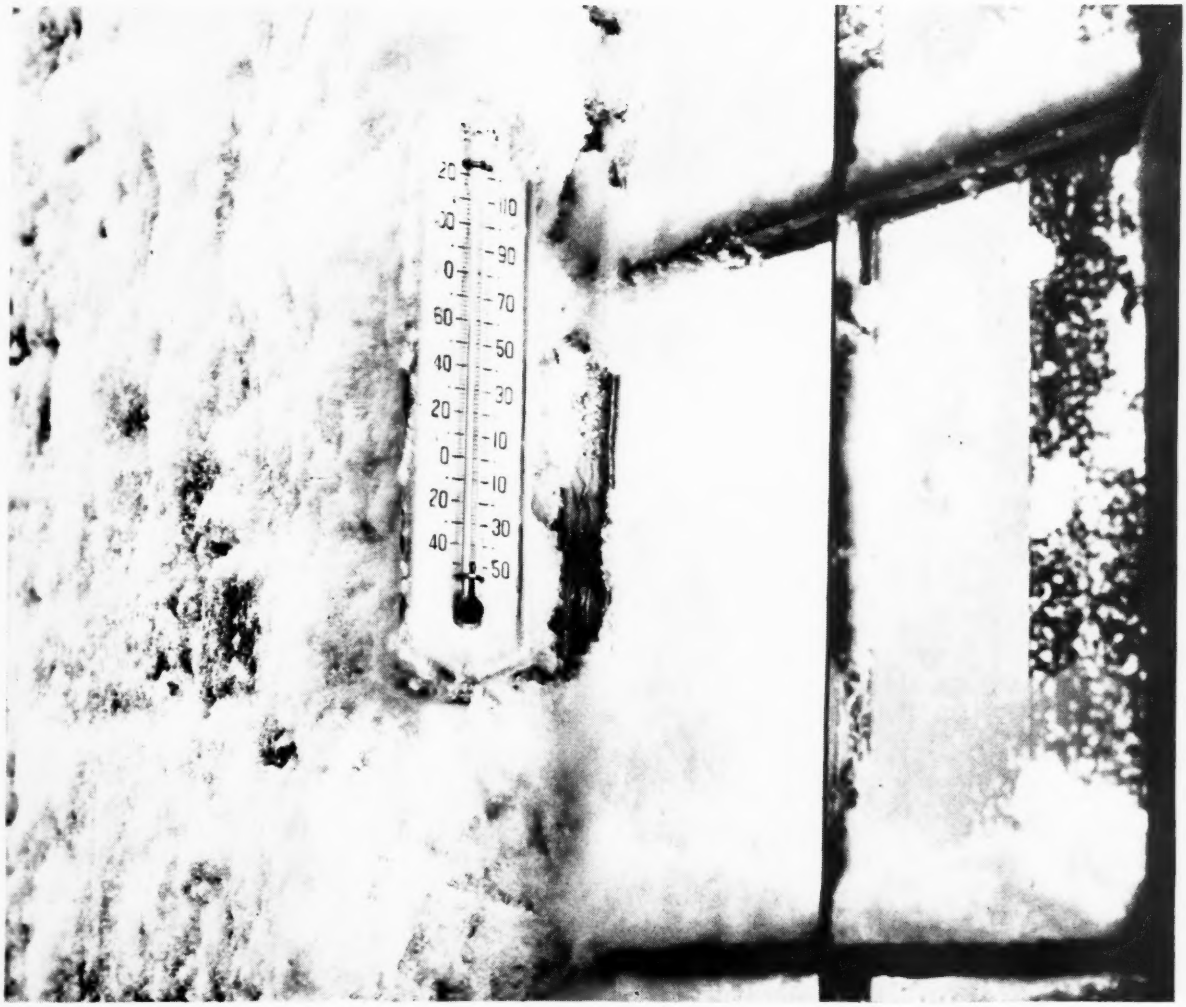
Committee for Industrial Research

A committee whose chief task it will be to stimulate the greatest interest in industrial research has been formed by the Federation of British Industries. Chairman is Sir William Larke, formerly director of the British Iron & Steel Federation. Other members are: S. B. Bagley (Bagley & Co.), W. Bond (Dunlop Rubber Co., Ltd.), T. A. Fairclough (Tootal Broadhurst, Lee & Co.), W. H. Glover (Courtaulds), W. H. Hatfield (Thos. Firth & John Brown), Lord Melchett (I.C.I.), Sir Felix Pole (Associated Electrical Industries), S. K. Thornley (Thornley & Knight), H. Whitenshaw (Penketh Tanning Co.), W. P. Griffiths (Mond Nickel), A. L. Hetherinton (Department of Scientific Research), C. C. Paterson (General Electric Co.), W. T. Braunholtz (Institute of Gas Engineers).

Notes on the British Rubber Industry

The shortage of crude rubber and the consequent changeover to synthetic rubber has made a number of complex measures necessary; therefore rubber control has had to be strengthened. For this reason E. Gore-Brown was made Rubber Controller. He will be assisted by F. D. Ascoli, formerly Rubber Controller, who now becomes Director of Rubber; by Lord Rothes, who continues as Director of Tires; and A. Healy, released by the Dunlop Rubber Co. and now Adviser on Synthetic Rubber Usage.

L. V. Kenward, well-known Dunlop executive, has retired. He was connected with Dunlop Rubber Co., Ltd., for 35 years, during which he served as chief accountant, secretary to technical committee, works secretary, sales operating superintendent, sales director (tires), general manager of subsidiary companies, director



WHEN IT'S COLD AS THE HINGES . . .

Perbunan oil-resistant synthetic rubber will stay flexible and hold a firm seal at extremely low temperatures.

PERBUNAN

Write STANCO DISTRIBUTORS, INC., 26 Broadway, New York City
Warehouse stocks in New Jersey, Louisiana and California

PERBUNAN

Troubled by unpleasant odors in your synthetic rubber goods?

Eliminate them with Givaudan Compounds!

Don't let the disagreeable odors imparted by many synthetic rubbers hinder the acceptance of *your* products. Givaudan has developed special compounds that "neutralize" such odors in Buna S, Buna N, Ethylene Polysulfide, Thiokol and other synthetics. And experienced research workers in Givaudan's modern laboratory are equipped to provide you with a deodorant or reodorant for *any* type of synthetic rubber.

A pioneer in the field of odor-masking materials, Givaudan has produced deodorants and reodorants to meet many varied needs. Manufacturers have found it both easy and economical to banish unpleasant smells by adding small amounts of the proper Givaudan compound to existing formulas.

Benefit from Givaudan's long experience. Write us today, outlining your odor problem. We will be glad to make recommendations without obligation.

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Industrial Aromatics Division

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rubber products group, including general rubber goods, rubber footwear, garments and sports goods divisions. Mr. Kenward also was chairman of the Labor Relations Conference for the Rubber Industry and first chairman of the National Joint Industrial Council for the Industry, which he helped to form. His latest service to the rubber industry was the organization of the Federation of British Rubber & Allied Manufacturers Association, whose first president he became.

Lecithin, for years known and used on the Continent as a softener disperser for rubber, is now being experimented with by the British rubber trade for use in both synthetic and reclaimed rubber. Lecithin, a phosphate or lipoid of vegetable origin, is being produced on a fairly large scale by Fredk. Boehm, Ltd., Beaconsfield, Bucks.

Plastics Products, Ltd., Barnet, originally formed with a nominal capital of £100, increased this by an additional £9,900 in £1 shares.

With the post-war use of laminated wall coverings in view, Wall Paper Manufacturers, Ltd., has acquired a substantial holding in James Ferguson & Sons, Merton Abbey, one of the largest manufacturers of plastics in the United Kingdom. Formed in 1905, it has an issued share capital of £71,800 and specializes in synthetic resins of the Bakelite type, marketed under the name Nestorite. It seems Wall Paper Manufacturers is chiefly interested in synthetic resins for bonding laminated wall coverings.

SOVIET RUSSIA

In Russia synthetic rubber and rubber produced from native plants like *kok-saghyz*, *Vatochnik*, guayule, etc., have been used as the bases for chlorinated rubber. Initial tests were made with rubber in a dry state as well as in solution, but all attempts at chlorinating dry rubbers ended in failure. To find the most suitable solvent, various substances were tested including 1,2,dichloroethane (ethylene chloride), chloroform, carbon tetrachloride, benzol and benzine, and best results were obtained with dichloroethane. The following concentrations were discovered to be the most advantageous with which to work: *kok-saghyz*, 3%; S.K.B., 3%, *Vatochnik*, guayule, and other resinous rubbers, 5%; Sovprene, 3%; Gutta percha from *cukomia* and *bceresklet*, 5%.

To chlorinate natural rubber completely, 50% more chlorine is required than the theoretical amount, that is, 4.5 kilograms[1] of chlorine are required for one kilogram of rubber. Tests indicated the following amounts of chlorine were necessary for Russian rubbers, *kok-saghyz*, 3.5 kilograms; *Vatochnik*, 3 kilograms; guayule, 4.5 kilograms; S.K.B., 3.5; and Sovprene, 3.5 kilograms.

The effect of temperature on chlorination has not been thoroughly explained even in the case of plantation rubbers. Peachy considers it best to chlorinate in cold; other investigators recommend chlorination at the boiling temperature of the solvent. Russian tests on *Vatochnik* with dichloro-ethane and carbon tetrachloride showed that in the initial stages of chlorination an intense exothermic reaction occurs which gradually subsides, and the solvent cools off. Chlorinated *Vatochnik* produced at various temperatures showed that changes in temperature do not seem to have much influence on chlorination; that is, chlorination can take place without the action of temperature from the outside.

As catalysts for accelerating the chlorination of resinous rubbers were tested iodine, $SbCl_5$ and $AlCl_3$. The use of iodine increased stability, but the presence of $AlCl_3$ and $SbCl_5$ increased the content of combined chlorine.

To help in selecting the most suitable apparatus for conducting the chlorinating process, the effect of iron and lead on the chlorination of S.K.B. was tested. The presence of iron had a deteriorating effect on stability and decreased solubility; in the presence of lead, solubility, but not stability decreased; but neither iron nor lead had any influence on the amount of chlorine combined.

When solutions of chlorinated rubber are stored after chlorination for 15 days in darkness and for five days in light, the content of chlorine increases 3-5% and stability is lowered. Numerous tests to remove the chlorine and hydrochloric acid before distilling off the solvents indicated that the best method was to wash with

[1] This value appears high if calculated on rubber hydrocrabon alone. Editor.

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ALKYD 18—an alkyd type resin emulsion which is non-yellowing and non-oxidizing. Film is water-white and non-tacky. Preferred where slight oxidizing action may be considered harmful to rubber. Extender for latex in coating, combining and impregnating process.

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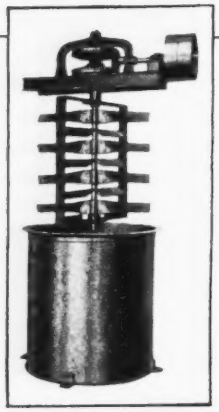

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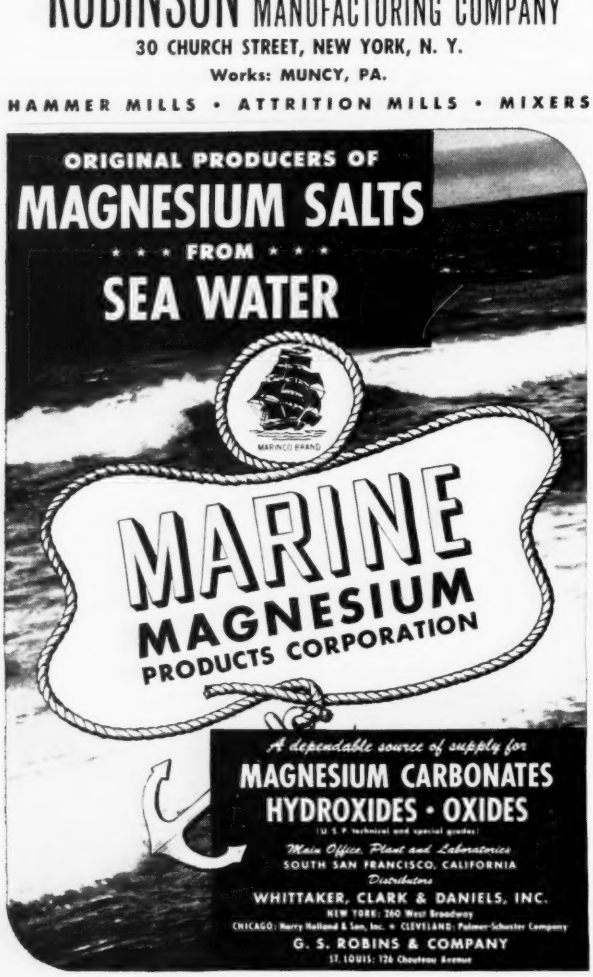

water, then bisulphite, and again water. Chlorinated rubber so treated was much lighter in color and more stable. The chlorinated rubber was most satisfactorily separated from the solution by distilling off the solvent, next the chlorinated rubber was ground to a fine powder in a ball mill with the addition of 0.5% ammonia solution. Then the powder was washed with water in a centrifuge and dried at 55-60° C. After drying, the moisture content was about 1%. With prolonged storage the stability of this chlorinated rubber decreased slightly; colder storage places seem to offer some slight advantage.

The resins in resinous rubbers for the most part chlorinate and eventually act as plastifiers, which is of advantage when lacquers are prepared. Chlorinated *Hevea*, for instance, when used for this purpose, requires the addition of 17-22% of plastifier; while 2-3% of plastifier suffices for chlorinated resinous rubbers.

As far as chlorine content and outward appearance are concerned, the closest resemblance to chlorinated plantation rubber was shown by *kok-saghyz* (up to 55% Cl.), Sovprene (to 59.5% Cl.), and *bereskket* gutta percha (58% Cl.). Then came *cukomia* gutta percha (54.8% Cl.) and S.K.B. (52%). Lastly were *Vatochnik* with 50% Cl. content; sunflower, with 42%; and guayule, 38% and 48.6%, depending on the type.

Chlorinated *kok-saghyz* and S.K.B. showed the highest viscosity so that it was possible to prepare lacquers, in xylol, with concentration of 15 to 20% rubber; the other types of chlorinated rubber have much lower viscosity, and the concentration, in xylol, must be 30 to 40%.

The stability of chlorinated rubbers was not impaired by heating for 12 hours at 60-80° C., nor did any softening of the rubbers take place when the temperature was maintained at 60°, but with prolonged heating at 80° chlorinated Vatochnik and S.K.B. began to soften. Incidentally, the stabilizers used—urea plus diphenylamine and urea plus diphenylguanidine, did not appear to have any marked effect on the stability of the rubbers tested.

To determine chemical stability, the chlorinated rubbers were subjected for two hours to the action of the following boiling acids: sulphuric (5%), nitric (0.5 and 50%), and muriatic (0.5 and 20%). The degree of destruction was judged by the loss in weight of the samples. Good resistance to the above acids in the concentrations indicated was shown by chlorinated rubber from S.K.B., *kok-saghyz*, Vatochnik, and guayule.

GERMANY

Gesellschaft für Synthese-Produkte, m.b.H., Frankfurt a.M., recently was established with a capital of 20,000 marks. A new oil subsidiary of I. G. Farbenindustrie, it will buy, erect, and operate plants for processing high-molecular paraffins and produce and sell chemical, chiefly synthetic, products. Furthermore it will set up and operate foreign branches and subsidiaries.

I. G. Farbenindustrie has recently acquired an interest in the Juganil company, a new Yugoslav firm producing chemical products, including aniline dyestuffs.

Since the invasion of Russia direct news from Germany about the rubber industry has been very sparse. *The London Rubber Age* has, however, secured various 1942 copies of the *Gummi-Zeitung*, formerly issued weekly, but now every two weeks and having only eight pages, often containing much Nazi propaganda.

However bits of news do come out, and from these an idea of the situation can be obtained. To begin with, the Germans still have difficulties in processing their synthetic rubber and still resort to heat treatment in the presence of oxygen under pressure, to overcome this. An alternative method seems to be to heat an emulsion of polymers, protected by antioxidants, in an autoclave in air, at 130-145° C.

Despite their advances in producing synthetic rubber, the Germans are also interested in obtaining rubber from *kok-saghyz* and *Euphorbia resinifera*, and an association has been formed to promote the cultivation of rubber-bearing plants in Germany. Incidentally, the *Gummi-Zeitung* mentions that Italy has some success with guayule.

The British air raids are responsible for what may be termed new movements in the German rubber industry. Small factories and shops devoted to tire retreading have been driven underground.

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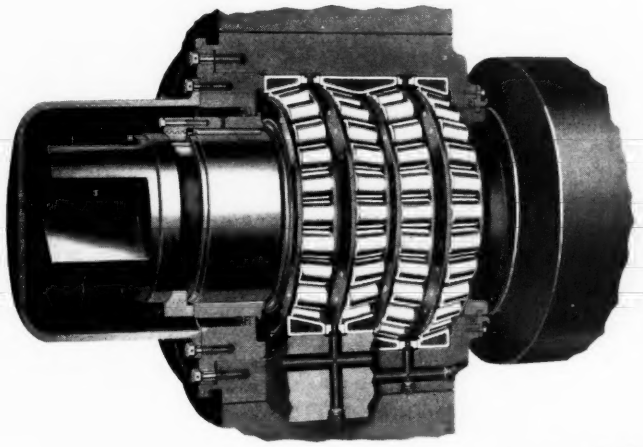

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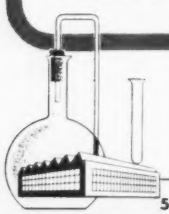

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but in their frequently very confined quarters they are exposed to the fumes from solvents and rubber solutions, to the detriment of the health of the workers. One doctor advised, among other remedial measures, that petroleum be substituted for benzol.

Germans also seem to feel safer farther east, and several new undertakings have lately been started in the eastern occupied zones. Thus a large new cable manufacturing company, Kabelwerk Krakau Betriebsgesellschaft m.b.H., has been formed in Krakau; capital is also being raised for a similar company in Prague. It may also be taken for granted that Germany is largely interested in a newly established Rumanian synthetic rubber factory. According to information gathered by Washington, this is the Rompren, A. G., capitalized at 5,000,000 lei, which apparently will operate in Bucharest. It seems that the Rumanian Government will receive 10% of the company's net profits and that the Petroleum Co., Petrolina, has placed its refinery at the disposal of the new company.

From our English source comes a list showing to what an extent certain German rubber manufacturers have been able to increase capital since 1939—at the expense, naturally, of all countries within the sphere of their influence:

	Capital in Rentenmarks	
	1939	1942
P. Betersdorf & Co., A.G.	5,000,000	15,000,000
Deutsche Kabelwerke, A.G.	8,000,000	16,000,000
Felten & Guilleaume, A.G.	64,500,000	96,750,000
Goetzwerke F. Goetze, A.G.	680,000	1,768,000
Gummi-Werke Elbe, A.G.	1,240,000	4,500,000
Markische Kabelwerke, A.G.	5,000,000	10,000,000
Vereinigte Asbestwerke Danco Wetzel & Co.	700,000	1,000,000
Vulkan Gummiwaren Fabriken Weiss & Baessler	600,000	1,200,000

The list is constantly being added to, it is reported.

HOLLAND

Hevea Rubber Co. in the Netherlands is reported to have called for the payment of 493,000 guilders for shares subscribed for but not paid. This amount is required, the company states, to enable it to continue its business and to expand it by undertaking the manufacture of Buna rubber.

FRANCE

Mention was made recently of plans to divert wild rubber from French Africa to Germany. Expected were 10,000 tons of *Landolphia*, *Funtumia*, and *Ceara* rubbers from French West and Equatorial Africa before the Allies prevented these plans from being carried out. From another British source, however, it is learned that during January-August, 1942, these territories actually did send 2,400 tons of rubber to France and Italy. Since French factories work for Axis account, Germany benefited to a considerable extent from these shipments.

Through *Gummi-Zeitung* it is also learned that H. Leduc and R. Dufour, who before the war had published notable papers on the use of high frequency electric current in various rubber processes, have continued this work. Of late they have been occupied with tests on concentrating latex by passing it through a tube of pyrex glass or similiar material, placed in a high-frequency field.

AFRICA

South Africa has an abundance of raw materials necessary for the production of synthetic rubber, H. A. Craig stated in a paper at a general meeting of the South African Chemical Institute (Natal Section). He discussed methods for making buna-type rubbers and the possibilities of establishing a synthetic rubber industry locally; he also said we are on the threshold of a new era of synthetics in which South Africa must play a part. The speaker estimated that it would cost between five and six million pounds

sterling to erect and equip a factory capable of producing the Union's present annual requirements.

Before the war, South Africa used 13,000 tons of rubber a year, chiefly in the form of tires; a fair amount of other rubber goods, as footwear and mechanicals as hose and belting, was also consumed. Present normal requirements are much higher.

In the years of the rubber boon, from 1909 to 1911, German planters in Tanganyika started several rubber plantations and had thousands of acres under *Ceara*. By 1913 yields permitted exports of 1,287 tons of rubber, and in 1914 the estimated number of tappable trees was put at 20,000,000. But meanwhile, the increasing outputs from the Far Eastern plantations caused prices to drop to a level where exploitation of *Ceara* became unprofitable, and the areas of *Ceara* were abandoned or cleared for other crops.

In the present emergency the British Government has turned once more to these old rubber lands, and it is working at the reclamation of such rubber areas as can be made productive again.

Cape Town is reported agog over a method of producing rubber from two local plants which James Dunbar and M. Lempke claim to have developed. Work is still in an experimental stage, but great expectations are cherished that the new method will eventually prove of great value and will not only solve the rubber shortage, but also make rubber production one of the greatest sources of wealth in the Union of South Africa. One of the plants, it is revealed, is a bush which reaches maturity in six months, and the other, a shrub, which becomes productive in 12-15 months. What the process, called the Barlem process, consists of, is kept secret, but it is stated that it will enable rubber to be produced on a commercial scale at about 2d. to 2½d. a pound and that the product will be better than Para rubber; it can be vulcanized repeatedly, will stand more pigment, and can be made harder than Para.

The two investigators claim also to be developing a new reclaim process which will yield a rubber that is vulcanizable and requires the addition of only a small percentage of new rubber.

Recent reports from East Africa indicate that the local branch of the Bata company [well-known pre-war Czechoslovakian footwear manufacturer] has been acting as government agent, actively stimulating the collection of wild rubber. In the Lamu district of East Africa, only 40 pounds of wild rubber were produced in 1939; this figure increased to 5,560 pounds in 1940 and to 15,000 pounds in 1941. During the first eight months of 1942 12,640 pounds were shipped; while a further 8,300 pounds were ready for export.

Though the Bata company has achieved good results, the Department of Agriculture will now take over the work of rubber collection. The natives require more training and supervision to prevent damage to the vines, and the preparation of raw rubber also needs more attention than it has hitherto received.

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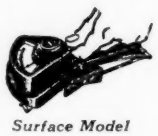

Surface Model

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Editor's Book Table

BOOK REVIEWS

"Rogers' Manual of Industrial Chemistry." Sixth Edition. Two Volumes. Edited by C. C. Furnas. Published by D. Van Nostrand Co., Inc., 250 Fourth Ave., New York, N. Y. 1942. Cloth, 6 x 9 inches. 1685 pages, 501 illustrations. Price, $17.

The contributions of fifty leading authorities of all the important chemical industries in America have been skillfully combined by C. C. Furnas to make this latest edition of the Manual a most complete reference work on industrial chemistry. It has been completely revised and rewritten, in light of the tremendous changes in the growth and scope of chemical industry which have taken place in the last two decades. Chapters on completely new chemical industries have been added, and some chapters which appeared in the older editions have been removed. Emphasis has been placed on footnote references to original sources and upon more extensive classified bibliographies at the end of the chapters. Numerous cross references are given between chapters to help the reader find information which is common to the different industries.

The book is divided into eight sections, with the first containing chapters on the fundamentals that apply to all industries: economic pattern, physical unit operations, chemical unit processes, high-pressure processes, industrial instrumentation, and water for municipal and industrial use. This is followed by sections on specific industries: heavy chemicals, fuels, refractories, metallurgical products, and surface coatings. The time-honored division into "Organic" and "Inorganic" industries has broken down in several places, since rigid adherence to this classification of subject matter is not tenable. The section on products of organic synthesis contains a chapter on plastics as well as new chapters on explosives and military gases. The final section on natural organic materials includes a chapter on rubber and rubber-like products.

The plantation industry, development of manufacture of rubber goods, materials of the industry, processing methods, rubber products, chemistry of natural rubber, and the chemistry of synthetic rubbers are covered in a relatively brief, but adequate manner by James W. Schade, former director of research, and Victor E. Wellman, manager, general chemical laboratories of The B. F. Goodrich Co., in the chapter on rubber and rubber-like products.

By means of this Manual the reader, whether he be student, engineer, or executive, can learn all the essential features of the various branches of modern chemical industry from a recognized authority; and then, if he so desires, he can continue his study by consulting any one of the numerous references listed in the classified bibliography at the end of each chapter.

"Substitutes." H. Bennett. Published by Chemical Publishing Co., Inc., 234 King St., Brooklyn, N. Y. 1943. Cloth, 5½ x 8½ inches. 225 pages. Price, $4.

This handbook of substitutes and alternates for chemicals, metals, fibers, and other commercial products should be particularly welcome at this time to chemists in the rubber and allied industries. The book is not complete or encyclopedic, but rather represents the concentrated essence of many years of experience of many chemists, engineers, and other technical workers.

A section on substitute requirements gives a brief discussion on each of the many possible properties or conditions, such as availability, pH, toxicity, density, stability, etc., a certain number of which must be investigated in detail for each particular substitute problem. The alphabetical list of substitutes, which comprises the major portion of the book, is preceded by a discussion of how the list may be best used to obtain the most complete choice of substitutes for any given material and an explanation of some of the ways in which the word substitute should be interpreted in commercial work. Where brand names are used in the list, they are given in quotes.

"Handbook of War Production." Edwin Arthur Boyan. Foreword by Erwin Haskell Schell. Published by McGraw-Hill Book Co., New York, N. Y. 1942. Cloth, 6 x 9 inches. 368 pages. Price, $3.

This book was written to cover particularly the problems in-

volved in converting plants to war production and to help in increasing the quality and speed of output of plants already so engaged. The substance has been provided by the experience and constructive counsel of more than 200 executives and government officials. As stated in the foreword, it is a concentrate of tested experience in war production.

The subject is treated in a practical way in chapters on: "Procurement of Contracts", "Conversion to War Production", "Procurement of Materials and Supplies", "Production Planning and Control", "Labor and Expansion", "Quality Control of War Products", "Conservation of Strategic Materials", "Industrial Accounting in Wartime", "Estimating for War Contracts", and "Planning and Control in Subcontracting." Gantt charts, which have been shown to be effective in providing graphical representation of a company's planned and actual progress, are used in various places throughout the book. The author gets down to cases in giving the experiences of manufacturers who have been most successful in meeting problems of planning and scheduling, labor, quality control, accounting, etc. Appendices give even more specific information on such things as processing and planning after contract award, and include forms of renegotiation clauses and escalator clause approved by the Under Secretary of War.

NEW PUBLICATIONS

"Behavior Study of Neville Synthetic Rubber Softeners." The Neville Co., Neville Island, Pittsburgh, Pa. 4 pages. Data on the following items for 13 softeners are set forth in this bulletin: physical state, incorporation time, mill temperature, processing properties, tack, dispersion, minutes cure at 280° F., 300% modulus, ultimate tensile psi, ultimate elongation %, hardness, rebound, % set, heat loss %, freezing temperature, and hardness after heat loss. Recipe for GR-S compound used is given.

"The Carbon Reenforcement of Buna S (GR-S)." Columbian Colloidal Carbons, Volume IV. Columbian Carbon Co., Binney & Smith Co., Distributers, 41 E. 42nd St., New York, N. Y. 152 pages. The results of an extensive investigation of the effect of carbon blacks of practically the complete range of surface areas on the rubber properties and processing and including two new physical tests for evaluation of Buna S (GR-S) rubber are reported in this publication. Part I (96 pages) is divided into sections on: Experimental Approach, which in addition to details on carbon black properties, describes Shore Creep—A New Measure of Loginess (equilibrium hardness value obtained after 30 minutes with a 2-pound dead weight load) and minimum surface area requirements essential to Buna S cure; Rubber Properties vs. Surface Area, which gives information on the effect of the various blacks on tensile, tear, modulus, hardness, rebound, and heat build-up; Rubber Property Correlations, in which cross-graphing is used to bring out important differences in the rate of change of properties with carbon surface and loading, as between different carbons; Summary, which gives quality indices for tire carcass and tread and four Buna S tire compounds; and concludes with Detailed Data, listing Buna S properties vs. carbon loading.

Part II gives the details of an investigation of the effect of batch size and mixing on cure and physical properties and concludes that the improved physical properties obtained by reducing batch size and slow addition of carbon black may be closely duplicated by using regular-size batches and carbon black addition rates if an extra 15 minutes of cure is added to a straight mill mix. Part III confirms the value of resting and cooling stocks between mixing and processing. Part IV gives data on the effect of high and low volatile carbons on Buna S reenforcement.

Part V describes a new flexing test and its use in an attempt to learn the best compounding procedure to improve flex cracking resistance of Buna S tire compounds. Reduction in fatty acid content appeared to be the most promising lead. The greater danger of overcures on tread quality with Buna S as compared with natural rubber is emphasized. Part VI gives an overall summary of the findings of the investigations with special reference to the selection of the proper types of carbon black to provide the best results in the final product. The publication is adequately illustrated with the usual excellent graphs of various types.

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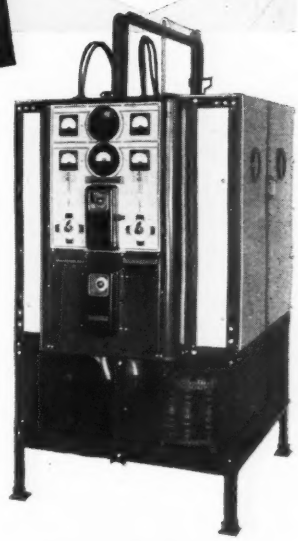

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"Service Notes on Buna-Carbon Compounding." Binney & Smith Co., 41 E. 42nd St., New York, N. Y. 7 pages. A description of the various grades of carbon black sold by this company with special reference to their development, the latest information on their properties, uses in natural and synthetic rubbers, and suggested definitions for clearer descriptions of the various types comprise the first part of this bulletin. Interesting information on processing Buna S tread stock in a No. 11 high-speed Banbury is next given in some detail. Important differences between compounding natural and Buna S rubber with carbon black and recommendations for the proper type of black for use in tire treads, tire carcass, and other rubber products conclude the bulletin.

"Importance of Plasticity in Processing 'Thiokol' Compounds." Technical Service Bulletin #2. Thiokol Corp., Trenton, N. J. 3 pages. Plasticity specifications for "Thiokol" FA compounds for hose tubes in the factory must be closely adhered to if processing losses are to be kept at a minimum. A modified Williams method for determining plasticity is described. A chart showing the effect of varying amounts of Altax on the plasticity of hose compounds is also included.

"Du Pont Rubber Chemicals." (Report No. 43-1.) February, 1943. Rubber Chemicals Division, E. I. du Pont de Nemours & Co., Inc., Wilmington, Del. 140 pages. This publication is divided into three parts. Part I includes a summary of chemical composition, properties, compounding characteristics, and uses of 26 du Pont accelerators or accelerator combinations, followed by the same information on 11 du Pont antioxidants. Where available, data on use with Buna S are included. Also in this part are presented summaries on miscellaneous rubber chemicals such as the Aquarex familly of mold lubricants and latex stabilizers, Barak, Isolac, and the RPA family of plasticizers. The details of the use of the RPA's with crude rubber are given in a practical way as are the details of the use of these materials in the production of pan reclaims.

Part II presents a discussion and listing of dispersed rubber colors and their dry powder counterparts with replacement ratio figures which, when used alone or in combination, should meet practically all needs. Dry powder colors for use in latex are also listed together with information for preparing water dispersions by grinding in a pebble mill.

Part III contains some very interesting data on the solubilities of rubber chemicals in rubber, neoprenes, and chemical solvents. Solubilities in water, benzene, 2B alcohol, and gasoline, all at 28° C. and 60° C. are given for 29 chemicals (accelerators, antioxidants, etc.) The solubility by both a milling and solution method of 25 chemicals in rubber is next given, followed by solubility of six chemicals in Neoprene Type GN. All these determinations are at 28° C. A table on the solubility of 25 chemicals in rubber and neoprene at 60° C. concludes the book.

"GR-S (Buna S) Compounding." Rubber Service Department, Monsanto Chemical Co., Akron, O. 119 pages. A large amount of data is given in more than 40 reports on laboratory compounding investigations with GR-S rubber in this publication. Emphasis is placed on oven aging of 24 hours at 90° or 100° C. as a means of obtaining a fairly rapid indication of embrittlement tendency in GR-S compounds. It was felt that any compounding materials or processing methods that would tend to prevent the increase in modulus and hardness and the decrease in elongation of these compounds on oven aging would show up in better service life of the finished products. Interesting results in minimizing bad aging effects by the use of "A-10" (formaldehyde-aniline) accelerator in combination with "Santocure" benzothiazyl 2-monocyclohexyl sulphenamide) accelerator are shown. About a half a dozen reports deal with the effect of hot and cold milling, regular and "eye dropper" addition of ingredients, and heating of GR-S in steam, air, etc. More than half of the reports deal with effect of variation of type and amount of compounding ingredients, including the use of varying amounts of whole tire reclaim, mostly on GR-S tread stock. Compounding with hard and soft channel blacks, furnace blacks, and different-type blacks in combination were also investigated. Special problems, as the use of peroxides in vulcanizing, comparison of regular GR-S, and special low fatty acid Buna S, and effect of antioxidants, are also covered.

"Supplement to Bulletin Entitled 'Replacement of Thermatomic Carbons and Furnace Type Blacks in Rubber Compounds.'" F. H. Amon and B. A. Wilkes. Godfrey L. Cabot, Inc., Boston, Mass. 8 pages. Additional data are presented to show that increased loading of Spheron #9 with a suitable decrease in the loading of Atomite whiting provides a better reproduction of the physical properties produced by 90 parts of Thermax, P-33, or Gastex in GR-S (Buna S) compounds. The pages are numbered for insertion in the original bulletin.

"The Shiftograph." George S. May Co., Chicago, Ill. Designed as a perpetual work shift schedule and reported as approved for consideration by industry by Donald M. Nelson, chairman of the War Production Board, this chart is so arranged that by turning the dial, the user can tell at a glance what shifts certain crews will work, the days they work, and their days off. The device offers a systematic procedure for the rotation of shifts. It is being distributed free of charge as this company's contribution to the war effort.

"Westinghouse Wartime Engineering." Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. January 1943. 32 pages. In place of the usual annual review of progress in electrical engineering and apparatus, this publication is offered as a brief account of the kinds of technical problems presented to a large engineering company in this time of war. Under headings of: "Adaptability—Solves War Problems", "Peacetime Machines in Uniform", "Production Lines Speed Tools of War", and "Victories in the Battle of Material", the story of some of these above-mentioned problems is told insofar as is possible under present-day conditions. In addition to the company's own photographs, official U. S. Army and Navy photographs are used to provide interesting illustrations for the booklet.

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Determination of Total Sulphur in Rubber and Rubber-like Materials. L. E. Cheyney, *Ind. Eng. Chem.*, Mar., 1943, pp. 164-65.

Proposed Substitutes for Rubber. *Tech. News Bulletin*, Mar., 1943, pp. 18-19.

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2,310,945. Scouring Implement with a Flat Body of Rubber Having on One Face Relatively Spaced Protuberances with Contact Ends Parallel to the Plane of the Face. M. Eisenberg, Mt. Burn, N. J., assignor, by mesne assignments, to Downy Products Co., Orange, N. J.

2,310,995. Sucker Comprising a Stem and an Elongated Rubber Sucker Foot Connected at One End to the Stem. W. A. Robinson, Sr., Chattanooga, Tenn., assignor to Miller Printing Machinery Co., Pittsburgh, Pa.

2,311,068. Stuffed Pleated Cushion, Having a Cover Fabric and a Backing Fabric and Strips of Flexible Rubber Vulcanized to Both Fabrics. J. R. Millar, Reno, Nev., assignor to National Automotive Fibres, Inc., Detroit, Mich.

2,311,095. Mowing Machine for Attachment to a Tractor, Including a Pivoted Lever Member Supported by a Distortable Elastic Material in Compression and Also in Torsion When the Mower Is Operating. H. W. Simpson and A. Abgarian, assignors to Detroit Harvester Co., all of Detroit, Mich.

2,311,112. A Friction Unit Including an Arcuate Metallic Shoe Adapted for Attachment to a Pneumatic Tire. W. H. Klocke, Woodhaven, N. Y., assignor to Cleveland Graphite Bronze Co., Cleveland, O.

2,311,116. A Non-Skid Shoe Comprising a Substantially Rectangular Member Having the Opposed Sides Thereof Formed of Complementary Angle Irons Arched Lengthwise to Conform to the Curvature of a Tire. J. B. Lau, Jersey City, N. J.

2,311,153. A Self-Adjusting Book Cover Including a Two-Way Stretch Elastic Material Adapted to Extend across the Outer Covers and the Back of a Book. R. Carlo, Tujunga, Calif.

2,311,166. A Knitted Fabric Having in Combination Elastic and Inelastic Yarns; the Elastic Yarn Is Incorporated under Tension and at Non-Adjacent Wales for Drawing the Wales Laterally together. O. Fregeolle, Pawtucket, assignor to Hemphill Co., Central Falls, both in R. I.

2,311,173. Card Case with a Casing for Holding a Stack of Cards with a Top Having an Opening upon Which Is Mounted a Thin Sheet of Elastic Material with a High Coefficient of Friction. R. O. Hill, Larchmont, N. Y.

2,311,277. Closure for a Bowl and the Like, Having a Transparent Hood with Elastic Bands Incorporated Therein in a Parallel Relation. H. J. Williams, Huntington Park, Calif.

2,311,287. Wheel and Axle Assembly Including a Sealing Device Consisting of a Wide Washer, a Sealing Ring, and a Ring of Sponge Neoprene Vulcanized Flatinise to Both Ring and Washer. E. G. Boden, assignor to Timken Roller Bearing Co., both of Canton, O.

2,311,308. A Structure Comprising a Metallic Member and an Integral Covering Layer thereon, the Latter Comprising a Solid, Plastic, Elastic, Sulphurizable Interpolymer of Isobutylene and Butadiene Characterized by an Elastic Limit, a Low Iodine Number, and a High Molecular Weight and Containing Combined Sulphur. R. M. Thomas and C. and W. J. Sparks, Cranford, N. J., assignors to Jasco, Inc.

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2,311,405. Manufacture of Brushes with Filament of Synthetic Polymeric Amides as Bristles Therein. M. L. Macht, Jersey City, and M. M. Renfrew, Arlington, both in N. J., assignors to E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

2,311,525. Suction Holding Device Having a Suction Member with a Back Section of Sponge Rubber. V. M. Ebbs, Somerville, assignor of one-half to W. F. Heavey, East Milton, Mass.

2,311,595. Rubber Door Stop in the Form of a Pyramid Having Relatively Wide Faces and a Plurality of Narrow Faces. L. M. Oakley, assignor to Essex Rubber Co., Trenton, N. J.

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2,312,024. Electrical Conductor Insulated with a Compound Including an Initially Flexible Rubber Mechanically Mixed with an Isobutylene Polymer. G. W. Brown, Fair Lawn, assignor to Okonite Co., Passaic, both in N. J.

2,312,072. Endless Vehicle Track with High Resilient Rubber Tread Members. H. S. Broadwater, Ridgefield, Conn.; V. Tenger, executrix of H. S. Broadwater, deceased, assignor to V. Tenger, Ridgefield, Conn.

2,312,200. Elastic Pile Fabric Including a Lamina of Rubber Elastically Bonded to Bases of Tufts and Ground Fabric. M. C. Teague, Ridgewood, N. J., and T. G. Hawley, Jr., Naugatuck, Conn., assignors to United States Rubber Co., New York, N. Y.

2,312,220. Washboard with a Relatively Flat Member Having Top and Bottom Edges and a Clothes Rubbing Surface on One Side and Spaced Attaching Means of Vulcanized Rubber or Like Elastic Resilient Material. J. L. Snyder, assignor of 3-10 to F. R. Ormsby and 3-10 to M. M. Sitz, all of Akron, O.

2,312,587. Radially Expansible Fluid Tight Tube for Coring Substantially Circular Passages in Concrete, Including a Vulcanized Rubber Wall of Substantial Thickness. H. S. Price, Dayton, O.

2,312,714. Horse's Gas Mask with a Rubber Outlet Valve. O. Herbin, Le Fidelaire, Eure, France; vested in the Alien Property Custodian.

2,312,852. A Light Sensitive Element with a Support Having a Film of Hydrophilic Polyvinyl Alcohol. W. C. Toland and E. Bassist, assignors to W. C. Toland, as trustee, Brookline, Mass.

2,312,853. Fountain Roller Including a Support Having a Fabric Covering with a Coating of Polyvinyl Alcohol. W. C. Toland and E. Bassist, assignors to W. C. Toland, as trustee, both of Brookline, Mass.

2,312,854. Light-Sensitive Product Including a Layer of Hydrophilic Polyvinyl Alcohol. W. C. Toland and E. Bassist, assignors to W. C. Toland, as trustee, both of Brookline, Mass.

2,312,911. Shoe Including an Adjustable Protective Rubber Pad. C. Jewtraw, New York, N. Y.

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2,313,151. Life Jacket Formed of Two Sheets of Rubber Material Secured Together Face to Face to Form Inflatable Chambers. J. H. Johnson, Delaware, O.

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2,313,689. Press Platen Including a Rigid Platen Body, Thin, Resilient, Flowable Slabs, and a Cover Slab of More Durable Resilient Material. R. H. Waters, Akron, O., assignor to Wingfoot Corp., Wilmington, Del.

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410,470. Life Saving Suit with Overshoes as an Integral Part Made of Waterproof material. H. L. Beauvais, Detroit, Mich., U. S. A.

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410,740. Resilient Mounting Comprising a Generally Cylindrical Body of Rubber, for Use between Two Relatively Movable Members Comprising a Rigid Tubular Metal Structure for Fixed Association with One of the Relatively Movable Members Formed with an Aperture in Its Wall. Firestone Tire & Rubber Co., assignee of C. Saurer, both of Akron, O., U. S. A.

410,813. Knit Elastic Hosiery Including a Circumferential Band of Fabric Knit from Fine-Gage Rubber Yarn. Berkshire Knitting Mills, Reading, assignee of W. E. Sheeler, Sinking Springs, both in Pa., U. S. A.

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410,962. Shoe Manufacturing Process Comprising Moistening a Substantially Dry Shoe Stiffener Blank Carrying a Homogeneous Mixture of Reactive Urea-Aldehyde Resin, Stabilized in Incompletely Condensed Condition, and Rubber with an Aqueous Solution of a Material Adapted to Accelerate the Condensation Reaction and Render the Blank Limp and Pliable. Armstrong Cork Co., assignee of R. Almy, both of Lancaster, Pa., U. S. A.

410,997. Garment Band Comprising a Strip of Sheet Rubber, Thin Stretchable Textile Material Completely and Snugly Enclosing the Strip of Rubber and Forming a Sheath Therefor. Faultless Mfg. Co., assignee of H. Hardie, both of Baltimore, Md., U. S. A.

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411,016. Stuffed Pleated Cushion with Narrow Strips of Soft Cured Rubber Alternating Space with Fabric Strips, and a Cover Fabric Overlying Having Vulcanized Bonds of Substantial Width to Form a Design. National Automotive Fibres, Inc., assignee of G. R. Cunnington, both of Detroit, Mich., U. S. A.

411,017. A Stuffed, Pleated Cushion Comprising a Cover Fabric, and a Backing Fabric United Along Lines Intermediate with Pleat Fullnesses, and Strips of Flexible Rubber Along These Lines Vulcanized to Both Fabrics. National Automotive Fibres, Inc., assignee of J. R. Millar, both of Detroit, Mich., U. S. A.

411,018. Elongated Strip of Uncured Rubber, for Use in Making Embossed, Decorative Trim Panels, Having Risers of Uncured Rubber Thereon in the Pattern of the Raised Embossment to Be Imparted to the Trim Panel, the Rubber Being a Quick-Curing Compound Adapted to Pass through a Stage of Semi-Fluidity upon Application of Heat at Temperatures Which May Be Transmitted Thereto through Upholstery Fabrics without Injury to the Fabrics. National Automotive Fibres, Inc., assignee of G. R. Cunnington, both of Detroit, Mich., U. S. A.

United Kingdom

550,702. Rubber-Soled Footwear. Fabrich Riunite Industria Gomma Torino W. Martiny Industria Gomma-Spiga-Sabit-Life.

550,734. Valves or Cocks. A. Hubbard & Rubber Bonders, Ltd.

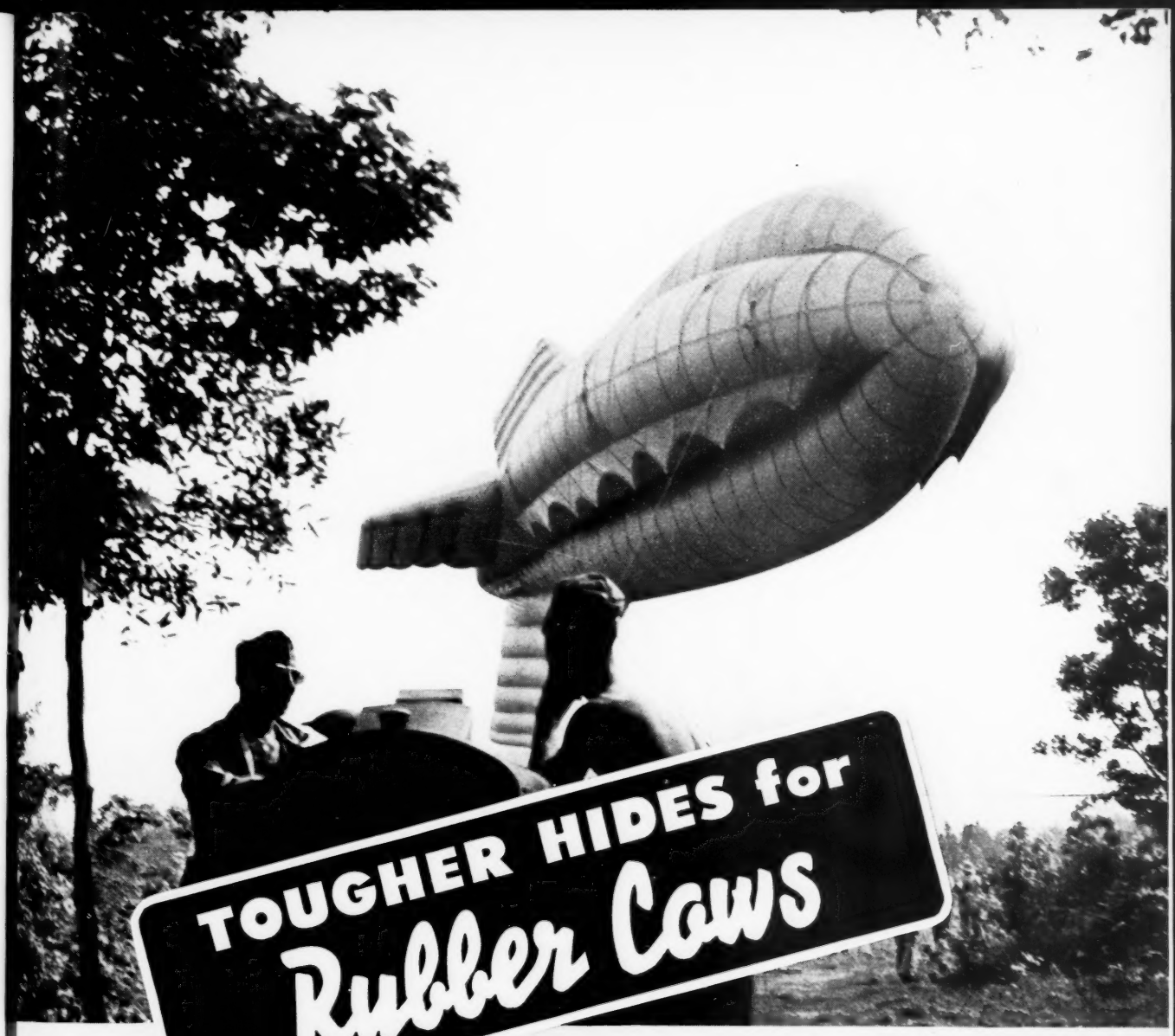
550,851. Valves for Pneumatic Tires and Other Articles. Dunlop Rubber Co., Ltd., & S. C. Parker.

550,863. Expansible Braided Wire Covers or Jackets for Rubber Tubes or Cartridges for Fluid Pressure Mining. Imperial Chemical Industries, Ltd., (E. I. du Pont de Nemours & Co., Inc.).

550,948. Friction Clutch or Brake Devices. A. H. Stevens, (General Tire & Rubber Co.).

550,990. Flexible Coupling Units. Andre Rubber Co., Ltd., and T. B. and R. D. French.

551,110. Friction Clutch or Brake Device. A. H. Stevens, (General Tire & Rubber Co.).



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A barrage balloon has to be tough to live through the beating it takes. Wind, rain, sleet, sun, cold and heat . . . combined with the stresses of pull, twist, tear and shock . . . add up to just about the most gruelling test to which synthetic rubber has ever been subjected. The synthetic rubber manufacturers have done an outstanding job in producing "rubber cows" that can "take it."

Many of the leading rubber manufacturers have found in Sun Circo Light Processing Oil a plasticizer which is highly compatible with most compounds and which helps to obtain the flexibility and toughness required to meet Government specifications. Circo Light Processing Oil has also stepped up production speed and decreased costs by reducing milling time and increasing the percentage of inert material.

A Sun "Doctor of Industry" will be glad to discuss your wartime compounding problems and submit specific recommendations for their solution. You will probably find that Circo Light Processing Oil can help to improve your production just as definitely as it has helped many other processors of natural, synthetic and reclaimed rubber. Write

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Sun Oil Company, Limited, Toronto, Canada

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PROCESS

United States

2,310,972. **Making an Oil-in-Water Type Dispersion Which Comprises Blending Together Reclaimed Rubber and Asphalt at a Temperature Above About 200° F. to Form a Uniform Mass.** H. J. Livermore and G. F. Lindner, both of Detroit, Mich., and H. N. Stephens, White Bear, assignors to Minnesota Mining & Mfg. Co., St. Paul, both in Minn.

2,310,988. **Making a Sound Record by Immersing a Suction Forming Die into an Aqueous Pulp Mixture Containing a Substantial Amount of Comminuted Water, Insoluble, Uncured Synthetic Resin, and a Smaller Amount of Fibers to Form on the Die a Wet, Grainless Resin-bearing Fibrous Pulp Article in Which the Particles of Resin are Enmeshed in the Fibrous Structure of the Article.** E. E. Sawyer, Waterville, assignor, by mesne assignments, to Canal National Bank of Portland, Portland, both in Me.

2,311,154. **A Continuous Process for Adding Flocculent Carbon Black by Accretion to Granules Already Formed in Which Amorphous Feed Is Introduced into the Process in Every Part of Which Is Retained a Mass of Previously Formed Carbon Black Granules, and Agglomerating the Amorphous Black to the Granules by Subjecting the Mixture to Motion Whereby the Particles Move by Gravity.** S. C. Carney, Bartlesville, Okla., assignor to Phillips Petroleum Co., a corporation of Del.

2,311,156. **Forming Predecorated Articles Having Finished Surfaces by Forming a Transparent Film-Like Sheet Having a Cellulose Acetate Base and Applying a Decorative Design to One Side of the Sheet, Using an Ink Containing a Toluene-Sulphonamide-Formaldehyde Resin.** L. V. Casto, Detroit, Mich.

2,311,244. **Forming an Aqueous Suspension of Fiber in Association with Binder Suitable for Sheeting Out on a Wet Machine by Adding a Diluted Varnish Base Binder to a Mass of Fibrous Asbestos and Mixing, Then Evaporating the Solvent to Cure Partially the Binder and Cause Particles to Attach Themselves to Fibers, and Thereafter Form an Aqueous Suspension of Binder Attached Fibers.** I. J. Novak, Trumbull, assignor to Raybestos-Manhattan, Inc., Bridgeport, both in Conn.

2,311,301. **Making an Adhesive Compound by Working Together Reclaim Rubber, a High-Melting Point Asphalt, and Wood Rosin at a Temperature Above 200° F. in an Internal Mixer to Form a Smooth Mass.** H. J. Livermore, Detroit, Mich., assignor to Minnesota Mining & Mfg. Co., St. Paul, Minn.

2,311,518. **Applying Polished Coatings to Sheet Units by Applying a Fluent Plastic Coating Which Wets the Panel and Dries Adhesively thereto, and Applying to the Outer Surface of the Coating a Flexible Surfacing Sheet Having a Polished Contacting Surface Adherent to the Surface of the Coating, thus Preventing Ruptures.** E. Caligari, Jr., Norfolk, Va.

2,311,605. **Hard Rubber Article Comprising Rubber, a High Percentage of Sulphur, and Zinc Selenide, and the Whole Mixed and Vulcanized with the Zinc Selenide Serving to Increase the Strength of the Article.** H. V. Allison, Fairfield, assignor to Allison Co., Bridgeport, Conn.

2,311,656. **A relatively Uniform, Unmelted, Soluble, Solid, Masticated, Homogeneous Heat Reaction Product Formed by Heating in Vacuum a Relatively Thin Sheet of a Mixture of Unvulcanized Rubber, a Salt of a Strong Acid, a Weak Acid, and less than 3% Sulphur.** T. R. Griffith, assignor to Honorary Advisory Council for Scientific & Industrial Research, both of Ottawa, Ont., Canada.

2,311,746. **Manufacturing Footwear by Sewing the Lower Edge Portions of an Upper to the Peripheral Portion of an Insole, then Sewing a Rubber-Covered Bias Ribbon About the Edge Portions of the Upper, Independently Cementing a Sheet or Layer of Agglomerated Cork between Two Sheets of Thinner Compact Cellulosic Material to Form a Sole, Placing It against the Insole, Cementing a Rubber-Covered Covering Ribbon or Strip in Place About the Bias Strip and Cementing a Sheet of Rubber to the Lower Surface of the Sole.** H. and O. Ghez, both of N. Y.

2,312,058. **Insulating and Covering Electrical Conductors by Applying One or More Layers of an Unvulcanized Rubber Insulating Compound to the Conductor by the Strip Method.** E. D. Youmans, Montclair, and W. F. Lamela, East Paterson, assignors to Okonite Co., Passaic, all in N. J.

2,312,993. **Manufacturing Rubber-Lined Pipe Including by Positioning a Rubber-Lined Tube Surrounded by a Covering of Porous Material within the Metal Pipe to be Lined, Placing Suitable Bonding Material between the Porous Covering and the Metal Pipe, Closing the Ends of the Pipe and Expanding the Rubber Lining and Its Porous Covering against the Inner Surface of the Metal Pipe to be Lined.** J. F. Stephens, assignor to Gustin-Bacon Mfg. Co., both of Kansas City, Mo.

2,313,154. **Preparing a Rubber Composition by Milling Rubber with a Cation Active Material and Water.** J. H. Kelly, Jr., and M. M. Stern, assignors to Dryden Rubber Co., both of Chicago, Ill.

2,313,156. **Inflating Pneumatic Tires to Proper Internal Air Pressure under Definite Road-engaging Lead Pressure.** G. C. Kratt, Jr., Nisswa, Minn.

2,313,314. **Producing an Arch Supporter by Selecting a Last, Shaping a Mold for it, Shaping Separate Thicknesses of Sheet Cork, Applying Rubber Cement to Both Sides of Each Sheet, Drying, and Applying Rubber Cement to the Last and Mold.** W. E. Blackburn, Gallup, N. Mex.

2,313,339. **A Method of Counterbalancing a Wheel Having a Rim, a Tire and a Tube on the Rim, Which Includes Locating and Measuring the Amount Which the Assembly Is out of Static Balance.** T. G. Hare, assignor to Amesbury Seat Mfg. Co., both of Ypsilanti, Mich.

2,313,508. **Making an Extensible, Tacky Sheet of Gasket Material by Calendering a Thin, Tacky, Compressible Coating Including Cork Granules, Rubber, and Asphalt.** F. H. Carman, assignor to Armstrong Cork Co., both of Lancaster, Pa.

2,313,650. **A Method for Embellishing Rubber Articles Comprising Molding the Unvulcanized Article into Its Final Form, Shaping from a Viscous Rubber Compound, Drying the Article, Vulcanizing It in the Absence of Pressure, and Preserving hereby the Original Form of the Ornaments.** J. Loewengart, assignor to Transcontinental Rubber Corp., both of New York, N. Y.

United Kingdom

550,391. **Spraying Rubber Latex.** C. F. Lumb.

550,443. **Crepe Rubber Solid Footwear and Method of Making Same.** W. H. Jackson and W. C. Clark.

550,481. **Manufacture of Rubber in Sheet or Crepe Form and of Rubber Articles.** B. Wilkinson, G. D. Ingram, and H. Waumsley.

550,507. **Molding of Contoured Rubber Mats and Like Articles.** Dunlop Rubber Co., Ltd.

550,837. **Process for the Preparation of Condensation Products of Hydroxyacetic Acids.** E. I. du Pont de Nemours & Co., Inc.

550,921. **Films Composed of Derivatives of Rubber.** Dunlop Rubber Co., Ltd., D. F. Twiss, and F. A. Jones.

550,952. **Manufacture of Artificial Leather.** E. I. du Pont de Nemours & Co., Inc.

MACHINERY

Dominion of Canada

410,095. **Tire Debeading Apparatus.** B. F. Goodrich Co., New York, N. Y., assignee of E. A. Davis, Akron, O., both in the U. S. A.

410,669. **Tire Mold and Hoist Unit.** Super Mold Corp. of California, assignee of E. A. Glynn, both of Lodi, Calif., U. S. A.

411,000. **Continuous Rubber Article Producing Apparatus.** Firestone Tire & Rubber Co., assignee of S. W. Alderfer, both of Akron, O., U. S. A.

United Kingdom

550,414. **Machine and Method to Slice or Split Crepe Rubber Sheets.** W. H. Jackson and W. G. Clark.

550,987. **Machines Adapted for Trimming Shoe Soles.** British United Shoe Machinery Co., Ltd.

550,990. **Flexible Coupling Units.** Andre Rubber Co., Ltd., and T. B. and R. D. French.

551,047. **Pumps to Lift Latex and Like Pressure-Sensitive Dispersions.** Latex Industries, Ltd., & L. Landau.

CHEMICAL

United States

22,268. (Reissue.) **Separating Isobutylene from Mixtures of Hydrocarbons by Forming an Acid Liquor by Contacting a Mixture of Hydrocarbons Containing Isobutylene with Sulphuric Acid.** L. A. Bannon and H. G. Schneider, Roselle, N. J., assignors to Standard Oil Development Co., a corporation of Del.

2,310,926. **The Process of Manufacturing Gas Expanded Rubber Which Includes Gassing a Rubber Sulphur Composition Containing a Retarder of Vulcanization of the Group Consisting of Formaldehyde, Acetaldehyde, Furfuraldehyde, Glucose, and Benzaldehyde.** R. C. Bascom, Merrick, assignor to Rubatex Products, Inc., New York, both in N. Y.

2,310,943. **The Acetals of Carbonyl Compounds Containing a Group Capable of Coupling with a Diazo Compound to Form an Azo Dye with Compounds of the Group Consisting of Polyvinyl Alcohol and Its Derivatives Having Free Hydroxyl Groups.** G. L. Dorough, Holly Oak, and D. M. McQueen, assignors, by mesne assignments, to E. I. du Pont de Nemours & Co., both of Wilmington, both in Del.

2,311,112. **A Method of Facilitating the Plasticizing of Crude Rubber During a Milling Operation, prior to Vulcanization, Which Comprises Milling Unplasticized Crude Rubber to Which is Added an Amount of Chromic Acid of the Order of about 0.01% to 1% Based on the Weight of the Rubber.** C. A. Klebsattel, West Orange, assignor to Martin Dennis Co., Newark, both in N. J.

2,311,249. **A Coating Composition Characterized by Its Adherence to Metals, Its Light and Heat Resistance, and Non-Stringing Quality, Including a Conjoint Polymer of a Vinyl Halide with a Vinyl Ester of a Lower Aliphatic Acid Combined with a Polymerized Lower Fatty Alcohol Ester of One of the Group Consisting of Acrylic and Methacrylic Acids.** G. M. Powell, III, Charleston, W. Va., assignor to Carbide & Carbon Chemicals Corp., New York, N. Y.

2,311,259. **A Plastic Composition Comprising a Vinyl Resin and a Plasticizer of Di(2-Ethylhexyl) Methyl Hexahydrophthalate.** C. E. Staff and W. N. Stoops, both of Charleston, W. Va., assignors to Carbide & Carbon Chemicals Corp., New York, N. Y.

2,311,271. **A Hard Bonding Heat Resistant Adhesive Containing Silica, Sodium Oxide, and an Admixture of Sulphonated Castor Oil, Aluminum Silicate, Zinc Oxide and a Coloring Agent form the group of Umber and Sienna.** W. C. Ware, assignor, by mesne assignments, to Industrial Abrasives, Inc., both of Chicago, Ill.

2,311,284. **A Plastic Containing Reaction Products of Alkaline Polysulphides and Olefin Compounds Combined with Sulphur Dichlorhydrin Plastic, Neoprene, Ozokerite and Sulphur.** C. Snyder, Yonkers, assignor to Liatex Corp., New York, both in N. Y.

2,311,327. **A Composition of Matter Consisting of Insoluble and Infusible Polymerized Diallyl Ester of a Polycarboxylic Acid Selected from the Group of Fumaric Acid, Sebacic Acid, Succinic Acid, Adipic Acid, and Phthalic Acid.** T. F. Bradley, Stamford, Conn., assignor to American Cyanamid Co., New York, N. Y.

2,311,341. **A Resinous Amino-Aldehyde Condensation Product Plasticized with a High Molecular Weight Alcohol, Obtained by Polymerizing Polyene Fatty Acids and Their Esters and Hydrogenating the Polymer to the Corresponding Alcohol.** W. B. Johnston, Stamford, Conn., assignor to American Cyanamid Co., New York, N. Y.

2,311,488. **A Method of Producing a Rubber Deposit on a Base by Including Two Coatings of a Non-Coagulating Composition Containing a Wetting Agent, and between the Two Coatings of Wetting Agent a Coating of a Coagulating Composition Having an Aqueous Vehicle Saturated with the Wetting Agent, and Then Associating the Coated Base with a Coagulable Aqueous Dispersion of Rubber.** R. E. Thomas, Stow, assignor to American Anode, Inc., Akron, both of O.

2,311,489. **Making a Sheet Material by Applying to a Supporting Web a Water Dispersed Resin, Then Applying over the Resin an Aqueous Suspension of a Colloid.** W. C. Toland and E. Bassist, both of Brookline, Mass., assignors to W. C. Toland, as trustee.

2,311,526. **A Luting Material Including Aluminum Flake Powder, Petroleum Lubricating Oil, Asphaltic Binder, and Small Quantities of Soap and Rubber.** W. C. Ferguson and P. Sussenbach, assignors to Presstite Engineering Co., all of St. Louis, Mo.

2,311,548. **The product of the Interpolymerization of N-Methylmethacrylamide and Methyl-Methacrylate.** R. A. Jacobson and C. J. Mighton, assignors to E. I. du Pont de Nemours & Co., Inc., all of Wilmington, Del.

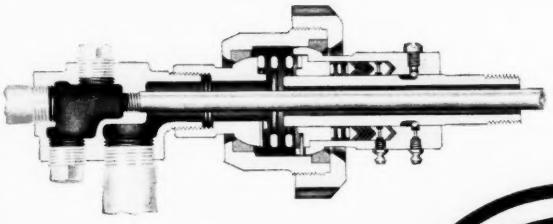
2,311,567. **The Process for Continuously Polymerizing a Substance Selected from the Group Consisting of Isobutylene and Vinyl Isobutyl Ether.** M. Otto, Oppau, H. Gueterbock, Ludwigshafen-on-the-Rhine, and A. Hellemanns, Oppau, both in Germany, assignors, by mesne assignment, to Jasco, Inc., a corporation of Louisiana.

2,311,587. **A Reaction Product of a Polymer-Forming Composition Which Comprises Reacting Material Selected from at least One of the Groups Consisting of Monoaminomonocarboxylic Acids, and Mixtures of Diamine with Dibasic Carboxylic Acid.** G. T. Vaala, assignor to E. I. du Pont de Nemours & Co., Inc., both in Wilmington, Del.

2,311,607. **Preparation of a Granular Styrene Copolymer by Polymerizing a Mixture of Styrene and a Minor Proportion of Diallyl Maleate.** G. H. Coleman and J. W. Zemba, assignors to Dow Chemical Co., all of Midland, Mich.

2,311,615. **Polymerizing a Mixture of Styrene and a Neutral Unsaturated Ester.** J. W. Zemba and G. H. Coleman, assignors to Dow Chemical Co., all of Midland, Mich.

2,311,653. **Improving the Lead Carrying Ca-**



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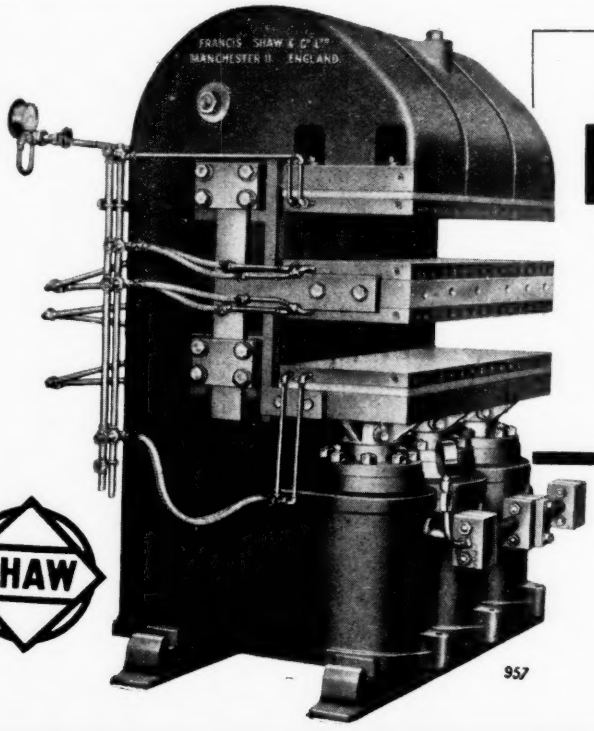

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R. 126

"Vinyl Polymer" Reprints To Be Available

Because of numerous inquiries, it is planned to prepare reprints of the series, "German Patents Relating to Vinyl Polymers," which has appeared in INDIA RUBBER WORLD during the past year or more. These reprints may be obtained *at a nominal cost* if a request indicating the number of copies desired is made before May 1, 1943.

pacity of a Machine Element by Chemically Treating Ferrous Metal with One of the Group of Mercapto, Hydroxy, Amino, Keto, and Chloro Organic Acids. B. Farrington, Berkeley, R. L. Humphreys, El Segundo, and R. T. Macdonald, Berkeley, assignors to Standard Oil Co. of California, San Francisco, all in Calif.

2,311,770. **Producing a Condensation Derivative of Rubber by Reacting Rubber with Boron Fluoride.** T. C. Morris, Belmont, Mass., assignor to Wingfoot Corp., Wilmington, Del.

2,311,781. **A Conjoint Condensation Product Consisting of an Unsaturated Rosinyl Compound, Selected from the Group of Unsaturated Rosin Acids and Esters thereof, an Aldehyde, and an Alpha-Beta Unsaturated Polycarboxylic Acid.** P. H. Scrutchfield, Chester, Va., assignor to Hercules Powder Co., Wilmington, Del.

2,312,193. **Preparing Alkylidene Derivatives of Alpha-Methylene Monocarboxylic Acids by Reacting an Aldehyde with an Anhydride of an Alpha-Methylene Monocarboxylic Acid in the Presence of an Acid-Reacting Condensation Catalyst.** H. J. Richter, assignor to E. I. du Pont de Nemours & Co., both of Wilmington, Del.

2,312,362. **The Method of Imparting Tack to an Unvulcanized Synthetic Rubber Prepared by Copolymerizing a Butadiene-1,3 Hydrocarbon and an Alpha-Methylene Nitrile.** D. V. Sarbach, Cuyahoga Falls, O., assignor to B. F. Goodrich Co., New York, N. Y.

2,312,437. **Plastic Masses Including Polyvinyl Compounds and Ethers of Low Volatility.** H. Orth, Troisdorf, Germany; vested in the Alien Property Custodian.

2,312,879. **A Process for Making Polymers by Heating a Reaction Mixture Comprising Essentially Bifunctional Reactants Which Comprise a Monoaminomonohydric Alcohol.** R. E. Christ, assignor to E. I. du Pont de Nemours & Co., Inc., both of Wilmington, Del.

2,312,963. **A Polyvinyl Acetal Resin Plasticized with a Mixture of Phenyl Ethyl Alcohol and an Alkyl Ester of Lauric Acid.** E. R. Derby, Springfield, Mass., assignor, by mesne assignments, to Monsanto Chemical Co., St. Louis, Mo.

2,313,039. **The Method of Preparing a Liquid Adhesive Which Comprises Dissolving Unplasticized Neoprene in Toluol to Which Has Been Added a Small Quantity of Morpholine.** R. D. Earle, Cohasset, assignor to Union Bay State Co., Inc., Cambridge, both in Mass.

2,313,144. **A Process for Preparing Dispersions of a Polymer by Employing a Dispersing Agent and a Solution of the Polymer in a Hot, Water Immiscible Volatile Organic Solvent.** A. S. Gomm, Blackley, Manchester, England, assignor to Imperial Chemical Industries, Ltd., a corporation of Great Britain.

2,313,146. **A Method for Reclaiming Waste Rubber Including Charging Unground Rubber Pieces and Introducing Steam Pressure.** J. Hirschberger, New York, N. Y.

2,313,233. **A Process for Polymerizing a Monomeric Mixture Containing a Butadiene Compound and at Least One Other Unsaturated Compound Which Contains a $CH_2=C<$ Group.** C. F. Fryling, Silver Lake, O., assignor to B. F. Goodrich Co., New York, N. Y.

2,313,363. **Method of Recovering a Stable Liquid Composition from Ungelled Latex Foam by Dispersing the Foam in an Aqueous Medium Containing an Alkali Hydroxide and Material Selected from the Group Consisting of Alkali Borates, Alkali Carbonates, and Alkali Phosphates.** W. J. Clayton and W. R. Hoover, both of Mishawaka, Ind., assignors to United States Rubber Co., New York, N. Y.

2,313,464. **Arresting the Gelling Properties of Latex Foam by Mixing an Alkali Hydroxide and Material Selected from the Group Consisting of Alkali Phosphates, Alkali Carbonates, and Alkali Borates with a Latex Foam.** W. J. Clayton, Mishawaka, Ind., assignor to United States Rubber Co., New York, N. Y.

Dominion of Canada

410,515. **A Heat-Resistant Composition Including an Artificial Thermoplastic Resin, Having a Vinyl Halide therein, Combined with at Least One Alcoholate of an Alkaline Earth Metal.** Carbide & Carbon Chemicals, Ltd., Toronto, Ont., assignee of W. M. Quattlebaum, Jr., Charleston, W. Va., U. S. A.

410,544. **A Solid Plastic for Forming Articles Comprising Polyvinyl Alcohol and a Solvent for Polyvinyl Alcohol.** Resistoflex Corp., New York, N. Y., U. S. A., assignee of E. Schnabel, Berlin-Lichterfeld, Germany, and C. Bangelmajer, Dover, N. J., U. S. A.

410,736. **Making Formed Shapes from Water Dispersions of Rubber Which Incudes in a Dispersion, a Potential Coagulant and a Stabilizing Excess of a Water Soluble Amine.** Dewey & Almy Chemical Co. of Canada, Ltd., Villa La Salle, P. Q., assignee of S. B. Neiley, Winchester, Mass., U. S. A.

United Kingdom

550,651. **Rubber Hydrochloride.** Wingfoot Corp.

550,852. **Filaments, Monofils, and Like Structures of Polymeric Hexamethylene Adipamide.** E. I. du Pont de Nemours & Co., Inc.

550,871. **Resinous Molding Compositions.** E. I. du Pont de Nemours & Co., Inc.

550,925. **Condensation Products of Formaldehyde and Monomeric Compounds.** E. I. du Pont de Nemours & Co., Inc.

UNCLASSIFIED

United States

2,311,136. **Latex Composition.** R. R. Sterrett, Naugatuck, Conn., assignor to United States Rubber Co., New York, N. Y.

2,311,789. **Tire Iron.** I. M. Taylor, United States Army.

2,311,999. **Balanced Tire Assembly.** J. A. Purvis, Chicago, Ill.

2,312,369. **Toy Balloon Holder.** S. Solecki, Chicago, Ill.

2,313,093. **Dielectric for Electrostatic Condensers.** S. Ruben, New Rochelle, N. Y.

2,313,094. **Electrostatic Condenser.** S. Ruben, New Rochelle, N. Y.

Dominion of Canada

410,824. **Tire Reenforcing Cord.** Canadian Industries, Ltd., Montreal, P. Q., assignee of G. P. Hoff, Wilmington, Del., U. S. A.

410,828. **Laminated Product.** Canadian Industries, Ltd., Montreal, P. Q., assignee of Wilmington Trust Co., Wilmington, Del., U. S. A.

TRADE MARKS

United States

400,060. Representation of a poster with a diver on one side and the words: "**Element Hydrovised Cloth Waterproof Plus Water-Repellent.**" Waterproof fabrics. Sea Island Mills, Inc., New York, N. Y.

400,109. **Riverside.** Tires and inner tubes. Montgomery Ward & Co., Inc., Chicago, Ill.

400,118. **Ustex.** Yarns. United States Rubber Co., New York, N. Y.

400,133. Representation of a fortress with the words: "**Junior General.**" Rainwear. Ben Fligel Co., Inc., New York, N. Y.

400,160. **Magic-Spray.** Salt and pepper servers. E. J. Osterhauer, doing business as The Oster-Bauer Shop, Rockford, Ill.

400,171. **Skyline.** Fountain pens and pencils. Eversharp, Inc., Chicago, Ill.

400,173. **Thiofide.** Vulcanization accelerator. Monsanto Chemical Co., St. Louis, Mo.

400,224. **Shock Absorber.** Belting. Lee Rubber & Tire Corp., Youngstown, O.

400,300. Representation of a divided circle with the words: "**Pee Pee-Cee Cee.**" Belting and chute lining. Potts-Curry Investment Co., Salt Lake City, Utah.

400,301. Representation of a divided circle with the words: "**Pee Reeflex Cee.**" Belting and chute lining. Potts-Curry Investment Co., Salt Lake City, Utah.

400,302. Representation of a divided circle with the words: "**Pee Rekproof Cee.**" Belting and chute lining. Potts-Curry Investment Co., Salt Lake City, Utah.

400,355. **Acidusol.** Vaginal douche. Texas Pharmacal Co., San Antonio, Tex.

400,394. Representation of a baby's face with the words: "**Baby Priscilla.**" Druggists' sundries. N. P. Steckler, New York, N. Y.

400,400. Representation of a rhinoceros with the word: "**Rhino-Sole.**" Rubber and plastic compositions for footwear repair. Rhino-Sole, Ltd., West Croydon, England.

Fixed Government Prices*

	Price per Pound: Civilian Use	Price per Pound: Other Than Civilian Use
Balata		
Manaos Block	$0.38¾	$0.38¾
Swinam Sheet	.42½	.42½
Guayule		
Guayule (*carload lots*)	17½	.31
Latex		
Normal (*tank car lots*)	.26	.43½
Creamed (*tank car lots*)	.26¾	.44¼
Centrifuged (*tank car lots*)	.27¾	.45¼
Heat-Concentrated (carload drums)	.29½	47
Plantation Grades		
No. 1X Ribbed Smoked Sheets	22½	.40
1X Thin Pale Latex Crepe	22½	.40
2 Thick Pale Latex Crepe	.22	.39½
1X Brown Crepe	.21⅜	.38⅞
2X Brown Crepe	.21⅛	.38⅝
2 Remilled Blankets (Amber)	.21¼	.38⅝
3 Remilled Blankets (Amber)	.21⅛	.38⅝
Rolled Brown	.18	.35½
Synthetic Rubber		
GR-M (Neoprene GN)	†	.45
GR-S (Buna S)	†	.36
GR-I (Butyl)	†	.35
Wild Rubber		
Upriver Coarse (crude)	.12⅝	.26⅛
(washed and dried)	.20¼	.37¾
Islands Fine (crude)	.14⅝	.28¼
(washed and dried)	.22½	40
Caucho Ball (crude)	.11⅝	.24¾
(washed and dried)	.19½	.37
Mangabiera (crude)	.08½	.19¾
(washed and dried)	18	.35½

*Rubber Reserve Co. Circular 17, which was released just as we were about to go to press and which supersedes all previous circulars, gives not only a complete list of all grades of all rubbers, including crude, balata, guayule, synthetic, and latex, but also full details on their distribution.

†To be determined later.

Dividends Declared

Company	Stock	Rate	Payable	Stock of Record
Baldwin Rubber Co.	Com.	$0.12½	Apr. 21	Apr. 15
Crown Cork & Seal Co.	Com.	0.50 q.	May 15	Apr. 15
Firestone Tire & Rubber Co.	Com.	0.37½	Apr. 20	Apr. 5
Fisk Rubber Corp.	Com.	0.06½ liquidating	Mar. 15	———
Garlock Packing Co.	Com.	0.50 reduced	Mar. 31	Mar. 20
General Tire & Rubber Co.	Com.	0.50	Mar. 25	Mar. 15
General Tire & Rubber Co.	6% Pfd.	1.50q.	Mar. 31	Mar. 20
B. F. Goodrich Co.	Com.	0.25 irreg.	Mar. 31	Mar. 19
Goodyear Tire & Rubber Co., Ltd.	Com.	0.62 q.	Apr. 1	Mar. 15
Goodyear Tire & Rubber Co., Ltd.	5% Pfd.	0.62½ q.	Apr. 1	Mar. 15
Jenkins Bros.	Non-Voting	0.25	Mar. 25	Mar. 12
Jenkins Bros.	Founders' Shares	1.00	Mar. 25	Mar. 12
Mansfield Tire & Rubber Co.	Com.	0.25 q.	Mar. 20	Mar. 10
Mansfield Tire & Rubber Co.	$1.20 Cv. Pfd.	0.30 q.	Apr. 1	Mar. 15
Rome Cable Corp.	Com.	0.15 q.	Mar. 30	Mar. 11
Seiberling Rubber Co.	$2.50 Pfd.	0.63 q.	Apr. 1	Mar. 20
Seiberling Rubber Co.	Pfd. Class A	1.25 q.	Apr. 1	Mar. 20
Thermoid Co.	Com.	0.10 irreg.	Mar. 31	Mar. 20
Thermoid Co.	$3 Pfd.	0.75	June 15	June 4
United States Rubber Co.	Com.	0.25 resumed	June 28	June 14
United States Rubber Co.	8% Non-Cum. 1st Pfd.	2.00	June 25	June 11

Thropp RUBBER MILL MACHINERY

. . for production and laboratory work

FOR over fifty years Thropp Rubber Mill Machinery has been noted for its outstanding performance in the laboratory and on the production line. All Thropp Machines are custom built to meet the specialized requirements of the rubber industry.

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- Calenders
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Wm. R. THROPP & Sons Co.
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PIGMENTS FOR THE RUBBER INDUSTRY

Red Lead (95% · 97% · 98%) Sublimed Blue Lead
Sublimed Litharge Sublimed White Lead
Litharge Basic White Lead Silicate
Basic Carbonate of White Lead

• The above products are among the comprehensive line of zinc and lead pigments manufactured by The Eagle-Picher Lead Company for the rubber, paint and other process industries. Eagle-Picher research facilities are available to manufacturers on request. Write for free samples and literature.

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Market Reviews

COMPOUNDING INGREDIENTS

QUIET prevailed over an expectant market last month. For though the synthetic rubber program has gained relatively little momentum to date, eyes are anxiously turned toward late 1943.

CARBON BLACK. The synthetic program has not progressed far enough to produce any noticeable effect on shipments of blacks. Volume increases in shipments are pending, however, especially in view of the fact that the synthetic product has been repriced to stimulate its use against natural rubber. It appears, also, that no very great amounts of GR-S will be available until the third quarter of this year.

CLAYS. Little change has taken place in the clay situation since February. A contributing factor may be that most of the synthetic rubber compounding research has thus far been directed toward tires and not much work has been done on mechanical goods compounding, where clay will presumably play a more important role.

PIGMENTS. The demand for titanium pigments by the rubber industry has been passive and also unchanged since mid-January.

RUBBER CHEMICALS. Sales for accelerators and antioxidants have been gaged to rubber consumption, but no big volume is anticipated until the latter part of this year. The expected increase in synthetic rubber production in the near future will undoubtedly affect the demand for accelerators and antioxidants, but it is not known to what extent.

VEGETABLE OILS. The OPA has taken favorable action on the vulcanized vegetable oil industry's request for upward revision of price ceilings. The vegetable oil situation has become critical, and restriction on uses is in the offing.

ZINC OXIDE. It is doubtful that the demand for zinc oxide will zoom with the speed-up of the synthetic rubber program. This is due to certain compound characteristics of zinc oxide in synthetic rubber which are likely to lessen the use of the former per hundred pounds of rubber hydrocarbon consumed. On the other hand there is a distinct tendency to enlarge the consumption of zinc oxide per hundred pounds of natural rubber consumed as a means of saving rubber. The volume of the natural rubber can be satisfactorily replaced by one volume of zinc oxide in many compounds.

The WPB on March 20 relieved zinc oxide consumers of the necessity of furnishing written statements to suppliers, as was previously required by General Preference Rating Order M-11-a, which certified that receipt of any further shipment by the consumer will not increase his inventory of zinc oxide in excess of a necessary minimum working supply. The amended order, however, does not remove basic limitations upon the permissible size of consumers' inventories.

Current Quotations*

Abrasives

Pumicestone, powdered	lb.	$0.035	/$0.04
Rottenstone, domestic	lb.	.025	

Accelerators, Inorganic

Lime, hydrated, *l.c.l.*, New York	ton	25.00	
Litharge (commercial)	lb.	.09	
Magnesia, calcined, heavy	lb.		
technical, light	lb.	.0625/	.07

Accelerators, Organic

A-1	lb.	.28	/ .33
A-10	lb.	.36	/ .42
A-19	lb.	.52	/ .65
A-32	lb.	.60	/ .70
A-46	lb.	.50	/ .57
A-77	lb.	.42	/ .55
A-100	lb.	.42	/ .55
Accelerator 49	lb.	.40	/ .42
808	lb.	.59	/ .61
833	lb.	1.13	/ 1.15
Acrin	lb.	.65	
Advan	lb.	.52	/ .60
Aldehyde ammonia	lb.	.65	/ .70
Altax	lb.	.43	/ .45
Arazate	lb.	1.53	
B-J-F	lb.	.38	/ .43
Beutene	lb.	.59	/ .64
Butasan	lb.	1.13	
Butazate	lb.	1.13	
Butyl Eight	lb.	.97	/ .99
C-P-B	lb.	1.95	
Captax	lb.	.38	/ .40
D-B-A	lb.	1.95	
Delac A	lb.	.39	/ .48
O	lb.	.39	/ .48
P	lb.	.39	/ .48
Di-Esterex-N	lb.	.50	/ .57
DOTG (Di-orthotoly-guanidine)	lb.	.44	/ .46
DPG (Diphenylguanidine)	lb.	.35	/ .36
El-Sixty	lb.	.40	/ .47
Ethasan	lb.	1.13	
Ethazate	lb.	1.13	
Ethylideneaniline	lb.	.42	/ .43
Formaldehyde P.A.C.	lb.	.06	/ .0625
Formaldehyde-para-toluidine	lb.	.63	/ .65
Formaniline	lb.	.36	/ .37
Guantal	lb.	.39	/ .48
Hepteen	lb.	.34	/ .39
Base	lb.	1.25	/ 1.40
Hexamethylenetetramine U.S.P.	lb.	.39	
Technical	lb.	.33	
Lead oleate, No. 999	lb.	.175	
Witco	lb.	.15	
Ledate	lb.	1.48	
M-B-T	lb.	.38	/ .40
M-B-T-S	lb.	.43	/ .45
Methasan	lb.	1.23	
Methazate	lb.	1.23	
Monex	lb.	1.53	
Morfex "33"	lb.	.67	/ .72
"55"	lb.	.96	/ 1.01
O-X-A-F	lb.	.38	/ .43
Oxynone	lb.	.77	/ .90
Para-nitroso-dimethylaniline	lb.	.85	
Pentex	lb.	.74	/ .84
Flour	lb.	.1225/	.1325
O	lb.		
Flour	lb.		
Phenex	lb.	.49	/ .54
Pipazate	lb.	1.53	
Pip-Pip	lb.	1.63	
R & H 50-D	lb.	.42	/ .43
Rotax	lb.	.48	/ .50
Safex	lb.	1.15	/ 1.25
Santocure	lb.	.60	/ .67
Selenac	lb.	1.98	
SPDX	lb.	.69	/ .74
A	lb.	.69	/ .74
Super sulphur No. 2	lb.	.13	/ .15
Tetrone A	lb.	2.20	
Thiocarbanilide	lb.	.28	/ .33
Thiofide	lb.	.43	/ .50
Thionex	lb.	1.53	
Thiotax	lb.	.38	/ .45
Thiurad	lb.	1.53	
Thiuram E	lb.	1.53	
M	lb.	1.53	
Trimene	lb.	.54	/ .64
Base	lb.	1.03	/ 1.18
Triphenylguanidine (TPG)	lb.	.45	
Tuads, Methyl	lb.	1.53	
Tuex	ton	1.53	
2-MT	lb.	$0.58	/$0.60
Ulto	lb.	.99	/ 1.04
Ureka	lb.	.50	/ .57
Blend B	lb.	.50	/ .57
C	lb.	.48	/ .55
Vulcanex	lb.	.42	/ .43
Z-B-X	lb.	2.45	
Zenite	lb.	.40	/ .42
A	lb.	.45	/ .47
B	lb.	.42	/ .44
Zimate, Butyl	lb.	1.13	
Ethyl	lb.	1.13	
Methyl	lb.	1.23	
Zipacel	lb.	1.65	

Activators

Aero Ac 50	lb.	.46	/ .52
Barak	lb.	.50	
MODX	lb.	.295	/ .345
SL-20	lb.	.1089/	.1135

Age Resisters

AgeRite Alba	lb.	1.95	/ 2.05
Gel	lb.	.52	/ .54
Hipar	lb.	.61	/ .63
Powder	lb.	.43	/ .45
Resin	lb.	.43	/ .45
D	lb.	.43	/ .45
White	lb.	1.23	/ 1.33
Akroflex C	lb.	.53	/ .65
Alhasan	lb.	.69	/ .74
Aminox	lb.	.43	/ .52
Antox	lb.	.54	/ .56
Betanox	lb.	.43	/ .52
B-L-E	lb.	.43	/ .52
Powder	lb.	.61	/ .70
B-X-A	lb.	.43	/ .52
Copper Inhibitor X-872-A	lb.	1.15	
Flectol H	lb.	.43	/ .55
White	lb.	.89	/ 1.00
M-U-F	lb.	1.48	
Neozone (standard)	lb.	.61	/ .63
A	lb.	.43	/ .45
C	lb.	.43	/ .55
D	lb.	.43	/ .45
Distilled	lb.	.48	/ .50
E	lb.	.61	/ .63
Oxynone	lb.	.77	/ .90
Permalux	lb.	1.18	/ 1.20
Santoflex B	lb.	.43	/ .55
BX	lb.	.54	/ .64
Santovar A	lb.	1.15	/ 1.40
Stabilite	lb.	.48	/ .69
Alba	lb.	.50	/ .74
Thermoflex A	lb.	.61	/ .63
C	lb.	.54	/ .56
Tysonite	lb.	.165	/ .1675
V-G-B	lb.	.43	/ .52

Alkalies

Caustic soda, flake, Columbia (400-*lb. drums*)	100 lbs.	2.70	/ 3.55
Liquid, 50%	100 lbs.	1.95	
Solid (700-*lb. drums*)	100 lbs.	2.30	/ 3.15

Antiscorch Materials

Antiscorch T	lb.	.90	
Cumar RH	lb.	.105	
E-S-E-N	lb.	.34	/ .39
R-17 Resin (*drums*)	lb.	.1075	
RM	lb.	1.25	
Retarder W	lb.	.36	
Retardex	lb.	.445	/ .475
U-T-B	lb.	.34	/ .39

Antiseptics

Compound G-4	lb.	1.50	
G-11	lb.	4.50	

Antisun Materials

Heliozone	lb.	.23	/ .24
S.C.R.	lb.	.32	/ .34
Sunproof	lb.	.2275/	.2775
Jr.	lb.	.165	/ .215

Blowing Agents

Ammonium Carbonate, lumps (500-*lb. drums*)	lb.	.0825	
Unicel	lb.	.50	

Brake Lining Saturant

B.R.T. No. 3	lb.	.0175/	.0185

Colors

Black			
Du Pont powder	lb.	.42	
Lampblack (commercial), *l.c.l.*	lb.	.15	
Blue			
Du Pont Dispersed	lb.	.35	/ .95
Powders	lb.	2.25	/ 3.75
Heliogen BKA	lb.		
Toners	lb.		
Brown			
Mapico	lb.	.1135	
Green			
Chrome	lb.	.25	
Oxide (*freight allowed*)	lb.	.24	
Du Pont Dispersed	lb.	.98	/ 2.85
Powders	lb.	1.00	
Guignet's (*bbls.*)	lb.	.70	
Toners	lb.		

*Prices in general are f.o.b. works. Range indicates grade or quantity variations. Space limitation prevents listing of all known ingredients. Prices are not guaranteed, and those readers interested should contact suppliers for spot prices.

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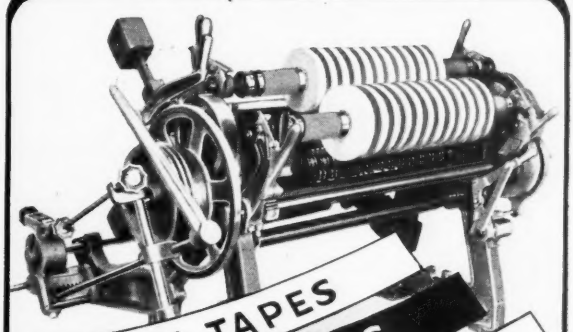

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Orange
Du Pont Dispersed ..... lb. $0.88/ $02.35
Powders ..... lb. 2.75/ 3.05
Toners ..... lb.

Orchid
Toners ..... lb.

Pink
Toners ..... lb.

Purple
Toners ..... lb.

Red
Antimony
Crimson, 15/17% ..... lb.
R. M. P. No. 3 ..... lb. .48
Sulphur free ..... lb.
R.M.P. ..... lb. .52
Golden 15/17% ..... lb.
7-A ..... lb. .37
Z-2 ..... lb. .25
Cadmium, light (400-lb. bbls.) ..... lb. .85 / .90
Du Pont Dispersed ..... lb. .93 / 2.05
Powders ..... lb. .60 / 1.65
Iron Oxide, l.c.l. ..... lb. .0675/ .15
Mapico ..... lb. .096
Rub-Er-Red (bbls.) ..... lb. .0975
Toners ..... lb.

White
Lithopone (bags) ..... lb. .0425/ .045
Albalith ..... lb. .0425/ .045
Astrolith (50-lb. bags) ..... lb. .0425/ .045
Azolith ..... lb. .0425/ .045
Titanium Pigments
Ray-bar ..... lb. .055 / .065
Ray-cal ..... lb. .0525/ .0625
Rayox ..... lb. .135 / .165
Titanolith (50-lb. bags) ..... lb. .056 / .0585
Titanox-A ..... lb. .145 / .175
B ..... lb. .0575/ .0625
30 ..... lb. .0575/ .0625
C ..... lb. .055 / .06
RC ..... lb. .055 / .06
RC-HT ..... lb. .055 / .06
Ti-Tone ..... lb.
Zopaque (50-lb. bags) ..... lb. .145 / .1525
Zinc Oxide
Azo ZZZ-11 ..... lb. .0725/ .075
44 ..... lb. .0725/ .075
55 ..... lb. .0725/ .075
66 ..... lb. .095 / .0975
French Process, Florence
Green Seal-8 ..... lb. .09 / .0925
Red Seal-9 ..... lb. .085 / .0875
White Seal-7 ..... lb. .095 / .0975
Kadox, Black Label-15 ..... lb. .0725/ .075
No. 25 ..... lb. .085 / .0875
72 ..... lb. .0725/ .075
Red Label-17 ..... lb. .0725/ .075
Horse Head Special 3 ..... lb. .0725/ .075
XX Red-4 ..... lb. .0725/ .075
23 ..... lb. .0725/ .075
72 ..... lb. .0725/ .075
78 ..... lb. .0725/ .075
80 ..... lb. .0725/ .075
103 ..... lb. .0725/ .075
110 ..... lb. .0725/ .075
St. Joe (lead free)
Black Label ..... lb. .0725/ .08
Green Label ..... lb. .0725/ .08
Red Label ..... lb. .0725/ .08
U.S.P. ..... lb. .105 / .1075
Zinc Sulphide Pigments
Cryptone-BA-19 ..... lb. .056 / .0585
BT ..... lb. .056 / .0585
CB ..... lb. .056 / .0585
MS ..... lb. .0575/ .06
ZS No. 20 ..... lb. .0825/ .085
86 ..... lb. .0825/ .085
230 ..... lb. .0825/ .085
800 ..... lb. .0825/ .085
Sunolith ..... lb. .0425/ .045

Yellow
Cadmolith (cadmium yellow), (400-lb. bbls.) ..... lb. .55 / .60
Du Pont Dispersed ..... lb. 1.25 / 1.85
Powders ..... lb. .70 / 1.75
Mapico ..... lb. .071
Toners ..... lb.

Dispersing Agents

Bardex ..... lb. .0425/ .045
Bardol ..... lb. .025 / .0275
B ..... lb. .05 / .0525
Darvan No. 1 ..... lb. .30 / .34
2 ..... lb. .30 / .34
3 ..... lb. .30 / .34
Nevoll (drums, c.l.) ..... lb. .02 / .025
Santomerse S ..... lb. .11 / .25

Extenders

Advagum 1098 ..... lb. .42 / .45
1198 ..... lb. .33 / .40
Extendex C ..... lb.
Naftolen ..... lb. .15 / .20
"600" S ..... lb. .14 / .16
Vanzak ..... gal. .05 / .06

Fillers, Inert

Asbestine, c.l. ..... ton 20.00
Asbestos Fiber ..... ton 15.50 / 48.00
Barytes ..... ton 40.00
f.o.b., St. Louis (50-lb. paper bags) ..... ton 25.55
Off color, domestic ..... ton 29.00
White, domestic ..... ton 38.50
Blanc fixe, dry, precip. ..... ton $80.00
Calcene ..... ton 37.50 / $43.00
Infusorial earth ..... lb. .0225
Kalite No. 1 ..... ton 26.00
3 ..... ton 36.00
Kalvan ..... ton 100.00
Magnesium Carbonate, l.c.l. ..... lb. .0725/ .1075
Paradene No. 2 (drums) ..... lb. .0525
Perax A ..... ton 7.50
Whiting
Columbia Filler ..... ton 9.00 / 14.00
Suprex White ..... ton 32.50
Witco, c.l. ..... ton 8.00
Witcarb ..... lb.

Finishes

Black-Out (surface protective) ..... gal. 4.50 / 5.00
Mica, l.c.l. ..... ton 20.00 /35.00
Rubber lacquer, clear ..... gal. 1.00 / 2.00
Colored ..... gal. 2.00 / 3.50
Shoe varnish ..... gal. 1.45
Talc ..... ton 25.00

Flock

Cotton flock, dark ..... lb. .095 / .11
Dyed ..... lb. .45 / .85
White ..... lb. .13 / .19
Rayon flock, colored ..... lb. 1.15 / 1.50
White ..... lb. 1.00 /

Latex Compounding Ingredients

Accelerator 552 ..... lb. 1.63
Aerosol OT Aqueous 25% ..... lb. .30
Antox, dispersed ..... lb. .54
Aquarex D ..... lb. .75
F ..... lb. .85
MDL Paste ..... lb. .25
Areskap No. 50 ..... lb. .18 / .24
100, dry ..... lb. .39 / .51
Aresket No. 240 ..... lb. .16 / .22
300, dry ..... lb. .42 / .50
Aresklene No. 375 ..... lb. .35 / .50
400 dry ..... lb. .51 / .65
Black No. 25, dispersed ..... lb. .22 / .40
Casein, muriatic 30 mesh ..... lb. .215
Collocarb ..... lb. .07
Color Pastes, dispersed ..... lb. .75 / 1.10
Copper Inhibitor X-872 ..... lb. 2.25
Dispersex No. 15 ..... lb. .11 / .12
No. 20 ..... lb. .08 / .10
Factex Dispersion A ..... lb. .17
Heliozone, dispersed ..... lb. .25
MICRONEX, Colloidal ..... lb. .06
R-2 Crystals ..... lb. 1.55
S-1 (400-lb. drums) ..... lb. .65
Santobrite Briquettes ..... lb.
Powder ..... lb.
Santomerse D ..... lb. .41 / .65
S ..... lb. .11 / .25
Sodium Stearate ..... lb. .40
Stablex A ..... lb. .90 / 1.10
B ..... lb. .70 / .95
C ..... lb. .40 / .50
Sulphur, dispersed ..... lb. .10 / .15
No. 2 ..... lb. .08 / .12
T-1 (440-lb. drums) ..... lb. .40
Tepidone ..... lb. .63
Tetrone A ..... lb. 2.20
Tysonite, dispersed ..... lb. .32 / .35
Zenite Special ..... lb. .47
Zinc oxide, dispersed ..... lb. .12 / .15

Mineral Rubber

Black Diamond, l.c.l. ..... ton 25.00 /30.00
B.R.C. No. 20 ..... lb. .0105/ .0115
Hydrocarbon, Hard ..... lb. 25.00 /27.00
MilliMar ..... lb. .055
Parmr ..... ton
Pioneer, c.l. ..... lb. 25.00 /30.00
285°-300° ..... ton 25.00 /27.00

Mold Lubricants

Aluminum Stearate ..... lb. .23 / .24
Aquarex D ..... lb. .75
MDL Paste ..... lb. .25
Colite ..... gal. .90 / 1.15
Lubrex ..... lb. .25 / .30
Mold Paste ..... lb. .12 / .30
Rubber-Glo, conc. regular ..... gal. .94 / 1.15
Type W ..... gal. .99 / 1.20
Sericite ..... ton 65.00
Soapstone, l.c.l. ..... ton 25.00
Zinc Stearate ..... lb. .30 / .31

Oil Resistant

A-X-F ..... lb. .82 / .85

Reclaiming Oils

B.R.V. ..... lb. .035 / .0375
C-10 ..... gal. .19 / .24
D-4 ..... gal. .17 / .22
E-5 ..... gal. .15 / .20
No. 1621 ..... lb. .021 / .0235
S.R.O. ..... lb. .02 / .0225
X-60 (reclaiming) ..... gal. .20 / .27
X-443 ..... gal. .29

Reenforcers

Alumina, Hydrated
Alorco C-740 ..... lb. .0375/ .065
C-741 ..... lb. .0375/ .065
Carbon Black
Aerfloted Arrow Specification (bags only) ..... lb. .0355†
Arrow Compact Granulized ..... lb. .0355†
Certified Heavy Compressed (bags only) ..... lb. $0.0355†
SPHERON ..... lb. .0355†/$0.07
Channel "S" ..... lb. .12
Continental, dustless ..... lb. .0355†
"AA" ..... lb.
Compressed (bags only) ..... lb. .0355†
Disperso ..... lb. .0355†
Dixie ..... lb. .0355†
Dixiedensed ..... lb. .0355†
66 ..... lb. .0355†
Furnex ..... lb. .035
Beads ..... lb. .035
Gastex ..... lb. .035 / .06
HX ..... lb. .0355†
Kosmobile ..... lb. .0355†
66 ..... lb. .0355†
77 ..... lb. .0355†
S ..... lb. .0355†
Kosmos ..... lb. .0355†
Dixie 20 ..... lb. .035†
MICRONEX Beads ..... lb. .0355†
Hi-Tear ..... lb. .0355
Mark II ..... lb. .0355
Standard ..... lb. .0355
W-5 ..... lb. .0355
W-6 ..... lb. .0355
P-33 ..... lb. .0475
Pelletex ..... lb. .035 / .06
SPHERON C (bags) ..... lb. .0455†
I (bags) ..... lb. .0405
N (bags) ..... lb. .15
T (bags) ..... lb. .09
Statex ..... lb.
STERLING ..... lb. .035
Thermax ..... lb. .0225
"S" ..... lb. .0675
TX ..... lb. .0355†
Velvetex ..... lb.
"WVEX BLACK" ..... lb. .0355†
Carbonex Flakes ..... lb. .03 / .035
S ..... lb. .031 / .036
Plastic ..... lb. .031 / .0335
Clays
Aerfloted Hi-White ..... ton 10.00
LGB ..... ton 15.00
Paragon (50-lb. bags) ..... ton 10.00
Suprex (50-lb. bags) ..... ton 10.00 /23.50
Catalpo, c.l. ..... ton 30.00
China ..... ton 25.00
Dixie ..... ton 10.00 /22.50
"L" ..... ton 10.00
Langford ..... ton 8.50
McNamee ..... ton 10.00
Par ..... ton 10.00
Paraforce, c.l. ..... ton 50.00
Witco, c.l. ..... ton 10.00
Cumar EX ..... lb. .05
MH ..... lb. .065 / .115
V ..... lb. .095 / .125
465 Resin ..... lb.
"G" Resin ..... lb.
Nevindene ..... lb.
Silene ..... lb. .04 / .045
"EF" ..... lb. .055 / .06

Reodorants

Amora A ..... lb.
B ..... lb.
C ..... lb.
D ..... lb.
Para-Dors ..... lb. .65 / 5.00
Rodo No. 0 ..... lb. 4.00 / 4.50
10 ..... lb. 5.00 / 5.50

Rubber Substitutes

Black ..... lb. .085 / .13
Brown ..... lb. .085 / .1375
White ..... lb. .09 / .15
Factice
Amberex Type B ..... lb. .1875
Brown ..... lb. .085 / .1375
Fac-Cel B ..... lb. .15
C ..... lb. .15
Neophax A ..... lb. .165
B ..... lb. .165
White ..... lb. .09 / .15

Softeners and Plasticizers

Ambidex Regular ..... lb.
S ..... lb.
B.R.T. No. 7 ..... lb. .02 / .021
Bondogen ..... lb. .98 / 1.05
Bunnatol (for synthetic rubber) ..... lb.
G ..... lb. .40 / .50
S ..... lb. .40 / .50
Burgundy pitch ..... lb.
Copene Resin ..... lb. .32
Cycline oil ..... gal. .14 / .20
Dipolymer Oil ..... gal. .33 / .38
Dispersing Oil No. 10 ..... lb. .0375/ .04
LM-Nypene (drums) ..... lb. .25
LX-436 (tank car) ..... lb. .027
Myristilene ..... lb. .20 / .30
Nevinol ..... lb. .13 / .14
Nuba resinous pitch (drums)
Grades No. 1 and No. 2 ..... lb. .029
3-X ..... lb. .29 / .0425
Nypene Resin ..... lb. .32
Palm oil (Witco), c.l. ..... lb.
Palmalene ..... lb. .15 / .25
Palmol ..... lb. .16
Para Flux (reg.) ..... gal. .17 / .18
No. 2016 ..... gal. .135 / .19

†Price quoted is f.o.b. works (bags). The price f.o.b. works (bulk) is $0.033 per pound. All prices are carlot.

RMP
ANTIMONY
FOR RED RUBBER

. . . . The utmost in pleasing appearance with no deteriorating effect whatever.

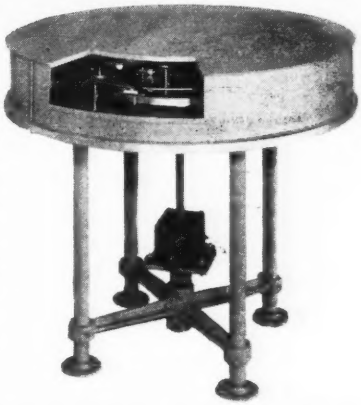
●

RARE METAL PRODUCTS CO.
BELLEVILLE, N. J.

Exact Weight Scales

Rotary Sorting Machine..

The new EXACT WEIGHT rotary classifiers were created for volume selection of small parts with severe tolerances. They do it accurately and swiftly. Parts to be weighed are discharged automatically from scale platters at the rate of 48 per minute and thus eliminate the personal element. If you have a volume rubber parts selection operation write us for full details. This machine may solve a knotty problem for you.



The Exact Weight Scale Company
420 W. Fifth Ave., Columbus, Ohio

THERE IS NO SUBSTITUTE FOR EXACT WEIGHT
INDUSTRIAL
PRECISION SCALES

SCHUSTER CALENDER GAUGE

. . . IT CAN NOW BE EQUIPPED WITH AUTOMATIC CONTROL

NEW—and more valuable than ever. For the past 13 years The Schuster Calender Gauge has proven itself an outstanding and indispensable instrument in the rubber industry. *Now* it automatically adjusts your rolls to a predetermined thickness and correctly maintains that thickness. Coatings for tire fabric and similar uses are kept accurate and uniform *automatically.* The result is a better product at a lower cost. Write us today for complete particulars.

THE MAGNETIC GAUGE COMPANY
60 EAST BARTGES STREET AKRON, OHIO
Eastern States Representative—
BLACK ROCK MANUFACTURING CO., Bridgeport, Conn.

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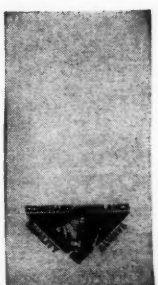
MOST *Effective*

of all white opacifiers!



Now available in any quantity without priority, but we will appreciate extension of any priorities available when ordering.

Sole Selling Agents:
The Chemical & Pigment Company
Baltimore, Md. • Collinsville, Ill. • Oakland, Calif.
Manufactured by
American Zirconium Corporation
Baltimore, Maryland

Para Lube	lb.	$0.046	/ .048
Paradene No. 1 (*drums*)	lb.	.0525	
Special (*drums*)			
20 to 35° C. M.P.	lb.	.0625	
35 to 45° C. M.P.	lb.	.0625	
45 to 75° C. M.P.	lb.	.0575	
Peptizene	lb.	.65	
Piccocizer "30"	lb.		
Piccolyte Resins	lb.	.147	/ .185
Piccoumaron Resins	lb.	.045	/ .15
Pictar	gal.	.18	/ .23
Pine tar	gal.		
Oil	gal.	.42	
Plasticizer B	lb.	.35	/ .45
Plastoflex No. 10	lb.	.20	/ .25
No. 20	lb.	.25	/ .30
Plastogen	lb.	.0775	/ .08
Plastone	lb.	.27	/ .30
R-19 Resin (*drums*)	lb.	.1075	
21 Resin (*drums*)	lb.	.1075	
Reogen	lb.	.115	/ .12
RPA No. 1E	lb.	.55	
2	lb.	.65	
3	lb.	.46	
4	lb.	.80	
Tackol	lb.	.085	/ .18
Tarzac	lb.	.23	/ .24
Tonox	lb.	.50	/ .59
Vistac No. 1	lb.	.20	/ .214
No. 2	lb.	.214	/ .227
Witco No. 20, *l.c.l.*	gal.	.20	
X-1 resinous oil (*tank car*)	lb.	.011	/ .016
XX-100 Resin	lb.	.0525	
Softeners for Hard Rubber Compounding			
Resin C Pitch 45°C. M.P.	lb.	.015	/ .016
60°C. M.P.	lb.	.015	/ .016
75°C. M.P.	lb.	.015	/ .016
Solvents			
Beta-Trichlorethane	lb.	.20	
Carbon Bisulphide	100 lbs.	5.75	
Tetrachloride	gal.	.80	
Cosol No. 1	gal.	.26	
No. 2	gal.	.25	
No. 3	gal.	.22	
Industrial 90% benzol (*tank car*)	gal.	.15	/ .22
Nevsol	gal.	.245	/ .31
Picco	gal.	.22	/ .32
Skellysolve	gal.		
Stabilizers for Cure			
Barium Stearate	lb.	.29	/ .32
Calcium Stearate	lb.	.26	/ .27
Laurex (*bags*)	lb.	.1475	/ .1725
Lead Stearate	lb.		
Magnesium Stearate	lb.	.31	/ .32
Stearex B	lb.	.145	/ .155
Beads	lb.	.1425	/ .1525
Stearic acid, single pressed	lb.	.145	/ .155
Stearite, *c.d.*	lb.	.1425	
Zinc Laurate	lb.	.29	/ .32
Stearate	lb.	.31	/
Synthetic Rubber			
Agrip! Solids *l.c.*	lb.	.44	/ .51
Solutions *l.c.*	lb.	.23	/ .275
Falkomer 106	lb.	.30	
108	lb.	.30	
Hycar OR-15	lb.	.63	/ .80
OR-25	lb	.56	/ .75
OS-10	lb.	.56	/ .75
Neoprene Latex Type 571	lb.	.25	
60	lb.	.36	
Neoprene Type CG	lb.	.70	
E	lb.	.65	
FR	lb.	.75	
G	lb.	.70	
ILS	lb.	.70	
KNR	lb.	.75	
M	lb.	.65	
Perbunan 26	lb.	.63	
Synthetic 100	lb.	.41	
"Thiokol" Type "A"	lb.	.35	
"FA"	lb.	.50	
"RD"	lb.	.70	
Molding powder No. 455	lb.	.71	
472	lb.	.61	
Tackifiers			
B.R.H. No. 2	lb.	.02	/ .021
LX-433 (*tank car*)	lb.	.068	
P.H.O. (*drums*)	lb.	.24	
Plastac	lb.	.10	/ .15
Vulcanizing Ingredients			
Magnesia, light (for neoprene)	lb.	.25	
Sulphur	100 lbs.	2.05	
Chloride (*drums*)	lb.	.04	
Telloy	lb.	1.75	
Thiogen 6	lb.	.18	/ .25
10	lb.	.18	/ .25
Vandex	lb.	1.75	
(See also Colors—Antimony)			
Waxes			
736 (clear)	gal.	1.25	
1515-A (black)	gal.	1.35	
Carnauba, No. 3 chalky	lb.		
2 N.C.	lb.		
3 N.C.	lb.		
1 Yellow	lb.	.8325	
2	lb.	.8125	
Carnube	lb.	.49	/ .59
Monten	lb.	.12	/ .17
Rubber Wax No. 118,			
Neutral	gal.	.76	/ 1.31
Colors	gal.	.86	/ 1.41

FINANCIAL

Baldwin Locomotive Works, Philadelphia, Pa., and wholly owned subsidiaries. For 1942: net income, $4,516,344, equal, after preferred dividends, to $4.23 a common share, against $3,356,914, or $3.11 a share, in 1941; sales, $167,259,141, against $68,643,191.

Columbian Carbon Co., New York, N. Y. For 1942: net income, $3,132,659, equal to $5.83 a share, against $3,529,159, or $6.57 a share, in 1941; sales, $19,579,627, against $21,121,296; consolidated current assets, end of 1942, $10,604,124; current liabilities, $3,103,040.

Dayton Rubber Mfg. Co., Dayton, O. Year ended October 31, 1942: net profit, $521,053, equal, after preferred dividends, to $2.42 a common share, compared with $710,291, or $3.50 a common share, in the preceding fiscal year; reserve for contingency, $300,000, against $175,000; federal income and excess profits taxes, $1,010,227, against $426,543; net sales, a record, $14,063,151, against $11,748,727; net working capital, October 31, 1942, $3,781,593, a year-end high, against $2,724,834 on October 31, 1941.

The B. F. Goodrich Co., Akron, O. For 1942: net profit, $9,524,706, equal after preferred dividends, to $5.72 a share, against $8,608,324, or $5.02 a common share, in 1941; reserve for contingencies, $2,000,000, against $6,000,000; federal income and excess profits taxes, $30,266,000, against $11,002,000; consolidated net sales, $238,784,372, against $211,454,790; current assets, December 31, 1942, $109,447,543, including cash of $12,220,930; current liabilities, $33,966,618.

Hewitt Rubber Corp., Buffalo, N. Y. For 1942: net profit, $442,543, or $2.65 a share, against $396,304, or $2.36 a share, in 1941; net sales, $12,082,934, against $9,202,067.

National Lead Co., New York, N. Y. For 1942: net income, $4,246,370, equal after preferred dividends, to 72¢ each on 3,090,664 common shares, against $5,375,685, or $1.10 a common share, in 1941; taxes, $7,908,457, against $10,015,669.

Pittsburgh Plate Glass Co., Pittsburgh, Pa. For 1942: net income, $11,237,132, equal to $5.09 a share, against $14,989,178, or $6.82 a share, in 1941; provision for income and excess profits taxes, $7,511,000, against $15,183,000; current assets, December 31, 1942, $59,025,963; current liabilities, $14,325,640, against the respective figures of $61,797,173 and $22,505,037 a year previous.

Raybestos-Manhattan, Inc., Passaic, N. J., and domestic subsidiaries. For 1942: net earnings, $1,622,084, equal to $2.58 a share, against $2,053,036, or $3.27 a share, in 1941; sales, $49,286,819, against $42,697,779; taxes, $7,747,860, against $5,575,984; current assets, December 31, 1942, $17,689,997; current liabilities, $5,923,598.

St. Joseph Lead Co., New York, N. Y., and subsidiaries. For 1942: consolidated net income, $5,655,625, or $2.89 each on 1,955,680 shares outstanding, contrasted with $4,893,455, or $2.50 a share, the year before; provision for federal income and excess profits taxes, $5,499,605, against $2,740,699.

RECLAIMED RUBBER

THE current high rate of production edged somewhat higher during the past month; yet despite this fact reclaimers cannot catch up with the demand. Progress is being made in the use of the "Victory" non-tire grades of scrap in providing usable reclaims for civilian goods. Based on trials with limited amounts of synthetic rubber scrap, the reclaim manufacturers feel that the regular equipment and processes with possibly minor modifications may be used to reclaim synthetic rubber, but a final decision will depend on real full-scale production runs. Preliminary results indicate that the reclaiming of synthetic rubber does not cause so great a loss of physical properties as the reclaiming of natural rubber. The present ceiling prices on selected grades of reclaimed natural rubber are listed below:

Ceiling Prices

	Sp. Grav.	¢ per Lb
Auto Tire		
Black Select	1.16-1.18	6½ / 6¾
Acid	1.18-1.22	7¼ / 7¾
Shoe		
Standard	1.56-1.60	7 / 7¼
Tubes		
Black	1.14-1.26	11¼ / 11½
Gray	1.15-1.26	12½ / 13¼
Red	1.15-1.32	12 / 12¾
Miscellaneous		
Mechanical blends	1.25-1.50	4½ / 5½
White	1.35-1.50	13½ / 14½

The above list includes those items or classes only that determine the price bases of all derivative reclaim grades. Every manufacturer produces a variety of special reclaims in each general group separately featuring characteristic properties of quality, workability, and gravity at special prices.

Scrap Rubber Ceilings

	¢ per Lb.
Inner Tubes†	
No. 2 passenger tubes	7¾
Red passenger tubes	7½
Passenger tubes	6
Tires‡	$ per Short Ton
Mixed passenger tires	30.00
Beadless passenger tires	38.00
Solid tires	34.00
Peelings†	
No. 1 peelings	75.00
No. 2 peelings	47.50
No. 1 light colored (zinc) carcass	82.50
Miscellaneous Items≠	
Air brake hose	25.00
Miscellaneous hose	17.00
Rubber boots and shoes	33.00
Black mechanical scrap above 1.15 sp. gr.	20.00
General household and industrial scrap	15.00

† All consuming centers except Los Angeles.
‡ Akron only.
≠ All consuming centers.

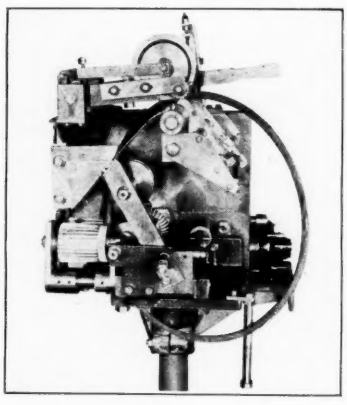
Porcelain Glove Forms

—for dipped rubber gloves, including linemen's or electricians' gloves and surgeons' gloves. Some are made from our own stock molds and others from customers' molds.

Write today for our new catalog covering rubber glove and other forms for dipped rubber goods. Prompt attention given to requests for quotations based on your specifications or stock items.

The Colonial Insulator Company
993 Grant St. Akron, Ohio

Utility Crimper Type Flipper
for
Truck and Large Balloon Tires



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Regular and Special Constructions
of
COTTON FABRICS

Single Filling **Double Filling**
and
ARMY
Ducks

HOSE and BELTING
Ducks

Drills

Selected
Osnaburgs

Curran & Barry
320 BROADWAY
NEW YORK

COTTON & FABRICS

NEW YORK COTTON EXCHANGE WEEK-END CLOSING PRICES

Futures	Jan. 30	Feb. 27	Mar. 6	Mar. 13	Mar. 20	Mar. 27
May	....	20.07	20.17	20.15	20.11	20.31
July	19.36	19.86	19.98	20.01	19.95	20.14
Oct.	19.06	19.69	19.74	19.73	19.79	19.96
Dec.	19.01	19.65	19.67	19.70	19.74	19.92
Jan.	....	19.62	19.62	19.64	19.70	19.91

New York Quotations

March 29, 1943

Drills

38-inch 2.00-yard	yd.	....
40-inch 1.45-yard		$0.29
50-inch 1.52-yard		.23⅞
52-inch 1.85-yard		.23223/.23¼
52-inch 1.90-yard		.20511
52-inch 2.20-yard		.185
52-inch 2.50-yard		.23851
59-inch 1.85-yard		

Ducks

38-inch 2.00-yard D. F.	yd.	.21½ /.22⅝
40-inch 1.45-yard S. F.		.29¾
51½-inch 1.35-yard D. F.		.33½
72-inch 1.05-yard D. F.	.43	/.45
72-inch 17-21 ounce		.48⅞

Mechanicals

Hose and belting	lb.	.42¾

Tennis

51½-inch 1.35-yard	yd.	.31½
51½-inch 1.60-yard	yd.	.27⅛
51½-inch 1.90-yard	yd.	.23⅛

Hollands—White

Blue Seal

20-inch	yd.	.13½
30-inch		.24¼
40-inch		.27

Gold Seal

20-inch	yd.	.14½
30-inch		.25¾
40-inch		.29

Red Seal

20-inch	yd.	.12¼
30-inch		.22
40-inch		.24½

Osnaburgs

40-inch 2.34-yard	yd.	.15½
40-inch 2.48-yard		.14⅜
40-inch 2.56-yard S. F.		.14578
40-inch 3.00-yard		.12¾
40-inch 7-ounce part waste		.15
40-inch 10-ounce part waste		.21⅜
37-inch 2.42-yard clean		.15¼

Raincoat Fabrics

Cotton

Bombazine 64 x 60	yd.	....
Plaids 60 x 48		....
Surface prints 64 x 60	lb.	....
Print cloth, 38½-inch, 64 x 60		.08971

Sheetings, 40-inch

48 x 48, 2.50-yard	yd.	.16200
64 x 68, 3.15-yard		.13968
56 x 60, 3.60-yard		.11944
44 x 40, 4.25-yard		.09764

Sheetings, 36-inch

48 x 48, 5.00-yard	yd.	.08600
44 x 40, 6.15-yard		.06991

Tire Fabrics

Builder

17¼ ounce 60" 23/11 ply Karded peeler	lb.	.55

Chafer

14 ounce 60" 20/8 ply Karded peeler	lb.	.54
9¼ ounce 60" 10/2 ply Karded peeler	lb.	.54

Cord Fabrics

23/5/3 Karded peeler, 1⅛" cotton	lb.	.55
15/3/3 Karded peeler, 1⅛" cotton	lb.	.55
12/4/2 Karded peeler, 1⅛" cotton	lb.	.54
23/5/3 Karded peeler, 1¼" cotton	lb.	.55

Leno Breaker

8¼ ounce and 10¼ ounce 60" Karded peeler	lb.	.55

THE March market inched its way along a narrow scale, keeping an anxious eye on activity in Washington, and traders strayed into the open only when price-raising legislation beckoned. Secretary of Agriculture Wickard's announcement granting farmers permission to increase their acreage 10% without losing AAA privileges and payments sent the market to the low of the month. The Department of Agriculture then enhanced the new measure by announcing the extension of federal crop insurance protection to include all cotton planted within 110% of the 1943 allotment. Any additional cotton acres are subject to the same insurance requirements as all other cotton regularly planted, and it was made clear that the action in no way alters or relaxes the demand that farmers must plant at least 90% of their war-crop goals in order to be eligible for benefit payments.

A 14-year high was scored when the Pace Bill was reported to the House Committee floor, but so much uncertainty accompanied its stay there that even final passage by the House failed to stimulate real activity. The board went up, however, on the news that the Senate Agricultural Committee approved the bill, though its ultimate fate was uncertain. House passage of the Bankhead Bill and favorable action on the similar-in-policy Steagall Bill improved buying sentiment a trifle, but the market remained in a rut. Prevention by the latter bill of the inclusion of benefit payments in calculating price ceilings is in line with the farm bloc's conviction that such inclusion is contrary to the intent of the Price Stabilization Act of last October.

Other contributing factors to market fluctuations were a negative reaction to Price Administrator Brown's opposition to enactment of pending farm measures; a similar response to a report that the CCC will soon release holdings for the manufacture of twine; and a positive result when news came through of larger government orders and lend-lease commitments.

The Journal of Commerce reported in its second 1943 survey that cotton growers as of early March intended to plant 22,938,000 cotton acres this year, against 22,678,000 reported February 10, and 23,310,000 in cultivation July 1, 1942. Acreage intentions are now 1.6% less than last year's sowings, against 2.7% previously reported.

The Bureau of the Census, in its final report for the 1942-43 season, stated that ginnings of the 1942 crop totaled 12,437,883 running bales, compared with 10,494,881 a year ago, and 12,297,970 two years ago.

According to the New York Cotton Exchange Service Bureau, CCC's supply of controlled American cotton is less than it was a year ago. CCC cotton distribution promises insignificance unless the government offers cotton for sale and moves as much staple out of its holdings as last year, said the Bureau. Total distribution during 1941-42 season aggregated 2,357,000 bales.

The price of 15/16-inch spot middling grade dropped from 21.89¢ on March 1 to 21.79¢ March 4, wound its way up to 22.17¢ March 26, and closed at 22.24¢ April 1.

Fabrics

Cotton fabric production in 1942 attained the record of more than 11,250,000,000 linear yards, according to the WPB Textile, Clothing and Leather Division, largely as a result of expanded military requirements and export demands. Cotton sales yarn production reported even greater increases to meet the requirement of heavyweight duck fabric, cordage, netting, webbing, and similar heavy cotton yarn consumers.

Production of certain fabric groups fell below 1941 figures mainly because of conversion of looms to bag sheeting and osnaburg required by Order L-99.

To increase cotton textile production the WPB ordered the cotton textile industry to simplify constructions of a specified list of fabrics. Approximately 20% of the total number of looms in the cotton textile industry are affected. Through the simplification of fabrics, they will be able to produce on these looms about 230,000,000 additional yards of cotton textiles annually, compared with the production possible January 1 under fabric and loom assignments then existing. It is estimated that this will represent a 10% increase in the particular looms involved and a 2% overall increase in total cotton fabric production.

The demand for cotton fabrics increased rather steadily in March. The market was firmer, under active request for cloth. High-grade fabrics are experiencing a liberal distribution among rubber manufacturers and others. Continuity of volume distribution and firm government prices are expected.

The demand on 36- and 40-inch sheeting numbers is exceptionally heavy because they are used for synthetic raincoats, rainsuits, and insulation cable work. All production is going on higher rated government contracts, and calls for these types are likely to be steady and continued. Requests are many for materials for civilian raincoats, which are scarce because mills are practically sold up on priority orders for government items.

New Rubber-Like Synthetics

NEW rubber-like products of the vinyl-polymer type, called Synflex and Insyn, have recently been announced. Insyn compounds for use in protective coating work may be applied by spreading, spraying, dipping, or calendering and produce a surface that is waterproof, acid, alkali, scuff, and wear resistant, non-toxic, and also oil and gasoline resistant.

The Synflex compounds are stabilized, plasticized and colored in various shades and may be obtained in a number of different shapes, that is, tubes and rods, etc. It is available in B & S wire gages from #24 to 1½-inch with a wall thickness according to needs. Tensile strength is between 2,500 and 3,200 pounds per square inch, and the product may be used at temperatures up to 70° C. Brittle point is about −45° C. Flame and oil resistance are good, as is resistance to coal-tar solvents, vegetable and animal oils, etc. at room temperature. Synflex is also resistant to acids and alkalies at 30% concentration by weight.

FROM SHIP TO BARGE TO BEACHHEAD BATTLE...

invading forces live a constant round of swift and dangerous action. And cotton helps make their victories possible — cotton helps to build the ships — cotton helps protect both men and guns — and cotton brings comfort to those wounded in action.

Ships, guns, planes, tanks — tents, towels — uniforms — knapsacks — cotton fabrics in tremendous quantity are vital to America's war effort. Government requirements for duck, for example, are so great that your normal supplies of our Hose and Belting Duck are available on a priority basis only.

WELLINGTON SEARS COMPANY • 65 Worth St., New York, N. Y.

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Cottons FOR ~~DEFENSE~~ OFFENSE ... WELLINGTON SEARS FOR *Cottons*

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Bold face type $1.25 per line (eight words)	Bold face type 55c per line (eight words)	Bold face type $1.00 per line (eight words)
Allow nine words for keyed address.		*Replies forwarded without charge*

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MEXICO CITY FIRM WISHES TO EMPLOY AN experienced engineer with good salary for the manufacture of rubber articles, including those for the Railroad in accordance with American Railroad specifications. Give full experience, qualifications, etc., in first letter. Address: MANUFACTURAS DE HULE, EL MUNDO, S. A., Av. 5 de Mayo #29—Desp. 401, Mexico, D. F., Mexico.

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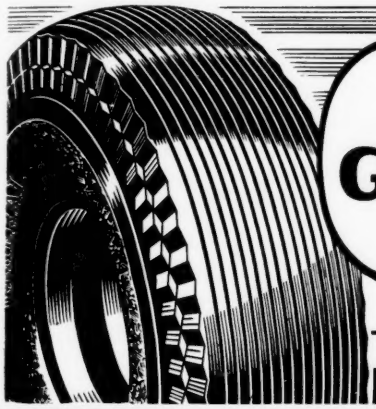

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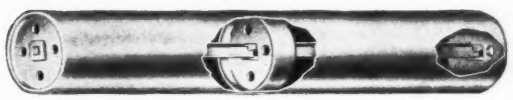

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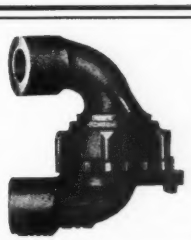

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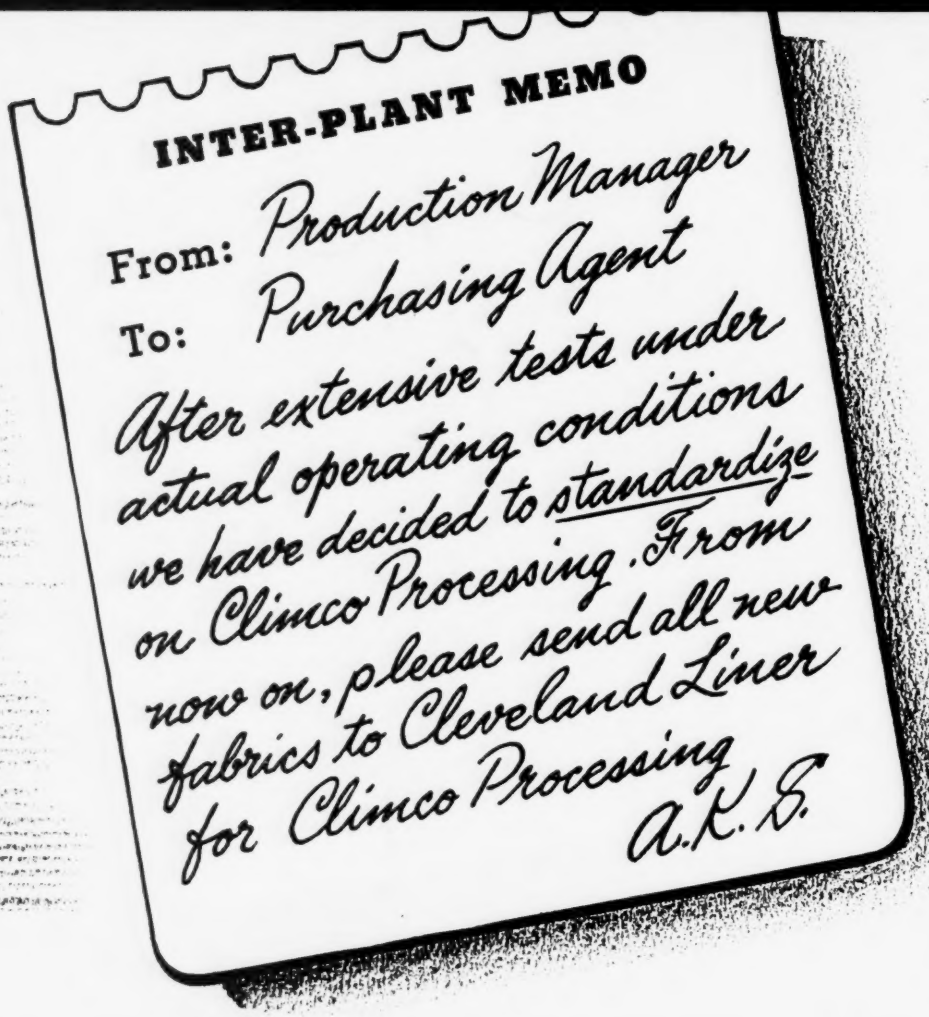
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